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Energy Transition

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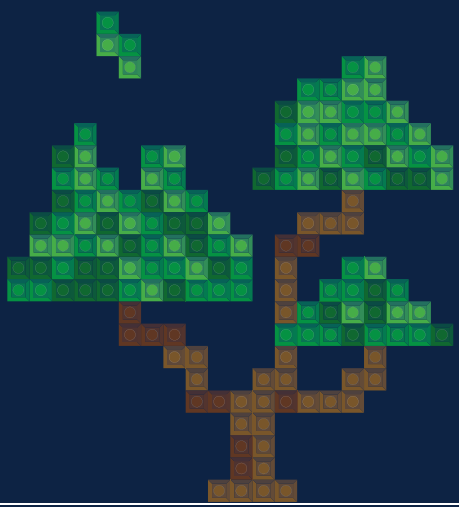

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Editor's letter

There is real energy for the transition

James Linacre
james.l@peimedia.com

With so much having been subject to reappraisal over the last year or so, it is heartening to see that investors' determination to tackle the climate crisis through greener, more sustainable infrastructure has not waned. If anything, the industry's resolve has been redoubled.

Global investment in the energy transition surpassed $500 billion for the first time in 2020. That this record investment was achieved in the face of covid-19 makes it all the more remarkable – and encouraging. The long march from dirty power supplies to cleaner, renewable generation continues. China is playing a significant role in this. The country remains the world leader in this field and solar now accounts for 16.6 percent of its power generation mix.

> **"It is not just investors who are excited, but also governments on every continent"**

Although solar attracted almost $150 billion of investment globally, more than $140 billion was invested in wind power, with offshore wind enjoying a record year. The US has lagged behind on offshore wind, but there is now change in the air and hopes of significant growth.

Investors are also looking beyond generation. Batteries have a positive future as part of the energy transition, while investors are also getting particularly hyped up about hydrogen, where the prospects are promising. The key to unlocking its undoubted potential may well be government support.

It is great to see, therefore, that it is not just investors that are excited, but also governments on every continent. The election of Joe Biden as US president, with all his promises of massive spending, including in support of the energy transition, seems to exemplify the renewed gusto with which the climate crisis is being tackled. We've picked out a few highlights.

Enjoy the report,

James Linacre

Infrastructure Investor

Energy Transition

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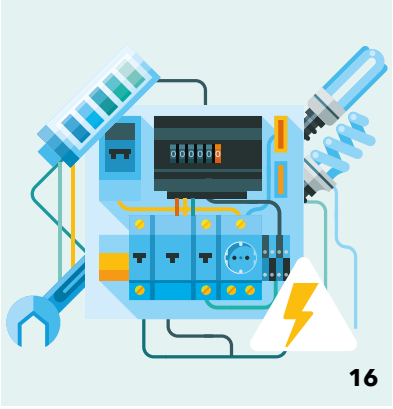
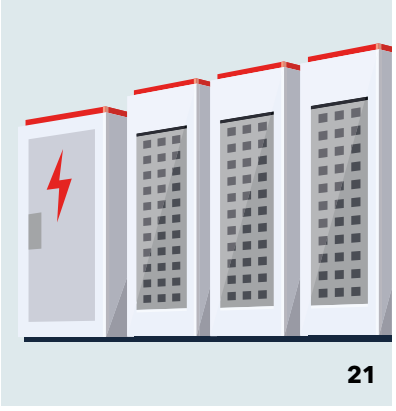
Insight

Analysis





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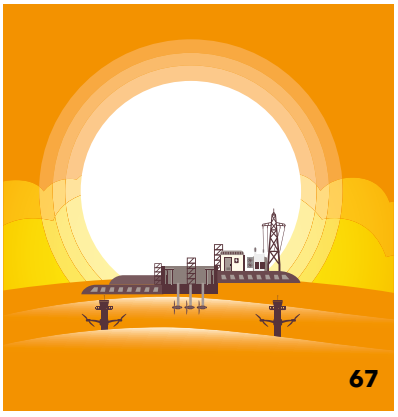

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Insight

Key trends **The energy transition picture is changing rapidly as sustainability rises up the agenda**

The last year could have seen the energy transition take a back seat, but investment increased to a record high, notwithstanding the economic disruption caused by covid-19, ***writes James Linacre***. The prospect of a green recovery from this recession has excited investors, with governments globally committing to action and President Joe Biden's administration raising hopes as to what might be achieved in the US.

Solar and wind power remain key pillars of the energy transition, but there is much more to the space than those two sub-sectors. Here are seven key themes to keep abreast of as the transition picks up the pace.

Record investment in the transition

Global investment in the low-carbon energy transition topped $500 billion for the first time last year. BloombergNEF figures show $501.3 billion went into projects involving renewable power, energy storage, EV charging infrastructure, hydrogen production and carbon capture and storage projects, as well as end-user purchases of low-carbon energy devices, such as small-scale solar systems, heat pumps and zero-emission vehicles.

The majority of this – more than 60 percent – was invested in renewable energy. Global new investment in renewables remains remarkably steady – it was $303.5 billion in 2020 and ranged from $277 billion to $313 billion over the five years before that. In fact, it has exceeded $250 billion for seven consecutive years.

Solar attracted $148.6 billion of investment, up 12 percent on 2019. Wind investment declined 6 percent but was still $142.7 billion. Offshore wind actually enjoyed a record year but was held back by a sizeable fall in onshore wind commitments.

Renewables remain key…

China is a global leader in solar power, producing more than any other nation. Figures from the International Renewable Energy Agency show the country produced 254,000MW of electricity from solar in 2020, well over triple the amount produced by the second-highest ranked country, the US.

"The share of solar energy in China's power generation mix increased by 16.6 percent in 2020 compared to previous years and the 14th five-year plan envisages that this should continue to increase," says Ying Fu, an energy and infrastructure lawyer at Linklaters.

Although wind investment dipped in 2020, it remained higher than in any year before 2019. It was only in 2014 that global investment in wind power surpassed $100 million for the first time.

In 2009, investment in wind was less than $69 billion. That was the year when Actis invested in its first wind farm in Latin America: PESRL in Costa Rica.

Mikael Karlsson, partner and head of energy and

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infrastructure at Actis, notes how far wind technology has come. When the firm invested in PESRL, the facility used 410KW turbines and had a total capacity of 24MW. "Our latest wind farm in Brazil offers 10 times that capacity per turbine, at 4.2MW," he says.

Such developments enable power to be sold more cheaply. "These cheaper units of power have a significant impact on economic development and offer a sustainable energy source," he adds.

...but there is plenty beyond renewables, too

For years, the energy transition conversation has been centred on renewables. The next frontier appears to be batteries. It remains difficult to buy large assets in Europe, but Barbara Weber, founding partner of B Capital Partners, notes that there are growing numbers of industrial players developing smaller-scale assets on the continent that can be rolled up into platforms.

"The sustainability aspect of batteries is very important and more significant than most people seem to know," says Weber. "German coal power plants are still generating over a quarter of total electricity in Germany and are also used for the primary reserve when a demand peak pops up. They run all year round with a massive negative sustainability impact."

The decarbonisation of the heat sector is another exciting frontier. Peter Bachmann, managing director at Gresham House, notes that many European nations have district heating networks and can use energy-efficient centralised equipment, but that countries such as the UK are a long way behind.

"The UK government has not really tackled the heat side of things," he says. He believes air-source heat pumps should be encouraged, as the government at one point looked set to do.

"They could be a really great way of taking people off oil," he says. "There are a lot of people in the UK that still use oil burners or use oil as their primary source of heat, which is incredibly environmentally unfriendly."

Christoph Bruguier, senior investment director at Vauban Infrastructure Partners, notes that district heating can go a long way to supporting the energy transition. "For example, we have invested in a Norwegian district heating and cooling asset that uses highly efficient and environmentally friendly pumps," he says. Waste-to-energy is another interesting theme, he notes, as is smart metering.

Breaking barriers to building back better

Globally, governments are united in their determination to facilitate a strong, green recovery from the pandemic. Where covid-19 could have pushed the climate change agenda down the priority list, it has instead increased people's environmental and social awareness.

"2020 was the most successful year for renewables fundraising to date," says Jeff DeBlock, partner at CBRE Caledon. However, while managers and investors are keen, and governments want to help, systemic roadblocks are preventing the pace of development from keeping up with interest. Permitting is causing delays of a year or more.

"As a result, almost no market within Europe has hit its targets for renewable generation over the past year and the future doesn't look much better," says Michael Ebner, managing director of KGAL Investment Management. He believes that governments will not be able to reach their climate targets unless pervasive nimbyism can be overcome, as it currently means project supply cannot keep up with appetite from investors.

"The political intent is there," says Daniel von Preyss, executive director and head of private equity and infrastructure at Impax Asset Management. "We have the money and we know how to employ it. But we are lacking a permitting structure that provides the certainty we require in order to fulfil what government, and the public, has tasked the private sector with achieving."

$501.3bn Record global energy transition investment achieved in 2020

$2trn Green stimulus promised by US President Joe Biden

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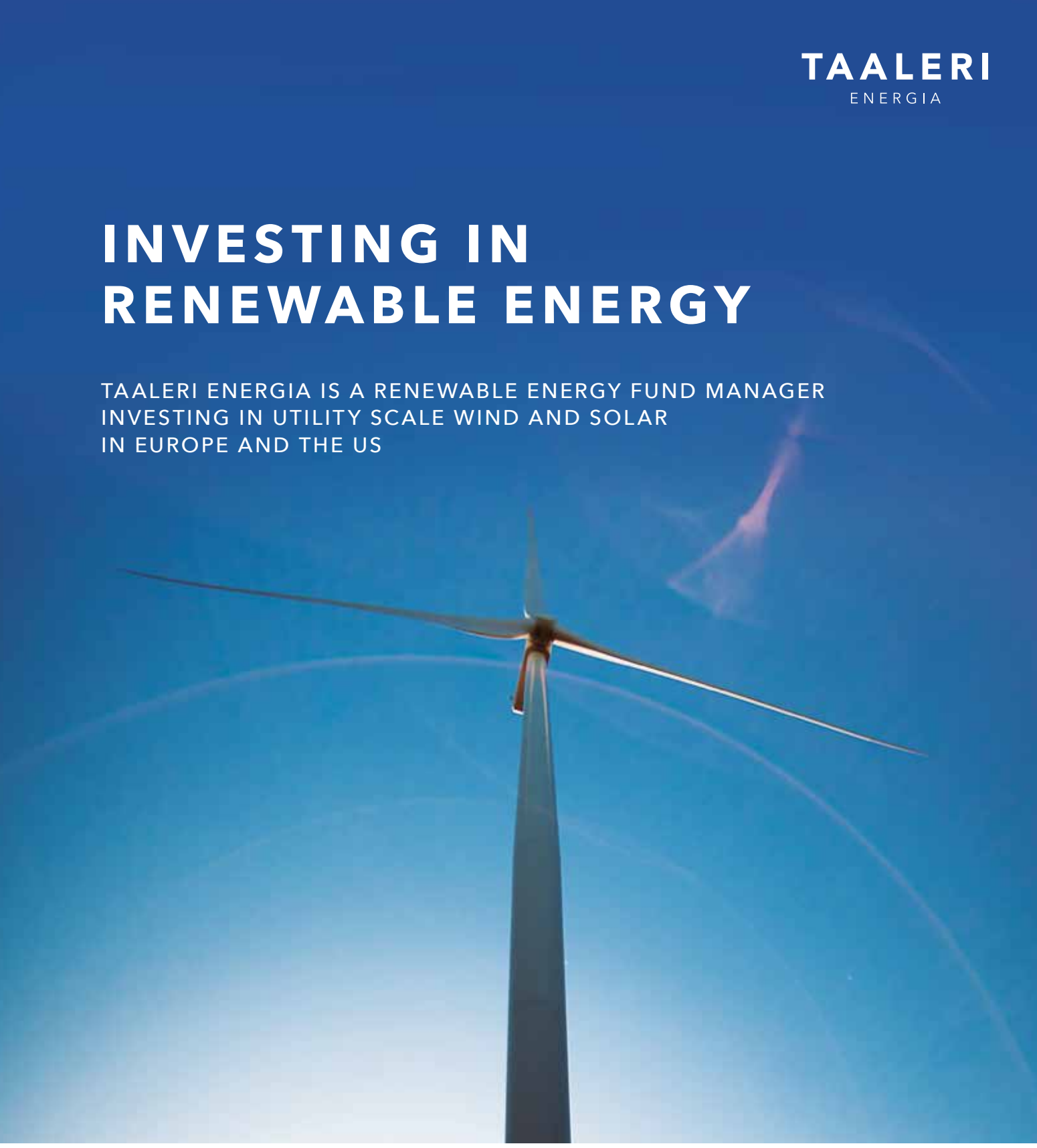

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Boost from Biden

The election of Joe Biden, who has promised a $2 trillion green stimulus, as US president should provide a welcome shot in the arm for energy transition efforts. Although such efforts have been underway in the country for well over a decade, Mark Voccola, senior managing director at Ardian Infrastructure, believes Biden's presidency "will likely create tailwinds behind renewables by dint of more favourable legislation or rulemaking".

If permitting is made easier, for example, then that is one obvious area of potential improvement. "The Biden administration has certainly made it clear that it views the energy transition as an important priority," notes Chris Ortega, managing director and head of Americas at Morgan Stanley Infrastructure Partners.

David Scaysbrook, managing partner at Quinbrook Infrastructure Partners, is similarly confident of a Biden boost, particularly when coupled with similarly ambitious international partners. He says: "There is no question that, between the announcements from the Biden administration and other potential announcements that may come out from other countries in the run-up to COP26 in November, we will witness a level of commitment to decarbonisation that has never been seen before."

> "The share of solar energy in China's power generation mix increased by 16.6 percent in 2020"
>
> Ying Fu, Linklaters

Gas as a bridging fuel…

Reducing coal usage remains important, particularly in Asia-Pacific. Liquefied natural gas can bring down coal consumption markedly.

Although LNG has historically been re-gasified in large facilities on dry land, more creative methods are starting to come through.

"Floating storage regasification units, for example, are much smaller in scale, have a much lower total capex cost than a landed LNG facility and, over time, are potentially mobile," notes Ortega.

"In some emerging markets, such as in parts of Asia-Pacific and India, coal continues to be the fuel source when demand ramps up, so making that transition from coal to gas is a material step in the decarbonisation evolution."

Voccola agrees that natural gas can play a key role, even in developed economies such as the US. He believes gas is "a great partner for renewables".

"The availability of cheap natural gas has enabled renewables to grow in the US over the past decade," he says. "And it will be around for decades because it will take time for renewables to gain further market share."

In that sense, natural gas can provide a stopgap solution while technologies are developed and new solutions emerge to make renewables more efficient. Alternatively, it could be used where local weather patterns do not lend themselves to dependency on renewables.

… with hydrogen as a goal?

Hydrogen could be the long-term solution. Although it is currently energy-intensive to produce, Voccola's colleague, Ardian managing director Amir Sharifi, believes two recent developments have changed the dynamic.

"The first is that the levelised cost of renewable energy has dropped below the €15 per MWh price, which makes producing green hydrogen more competitive," he says. "The second is that governments are now starting to back hydrogen."

That government support is particularly important because hydrogen production remains so expensive. The EU and US both have ambitious hydrogen strategies.

Hydrogen can be seasonally stored and transported cost-effectively over long distances by ship or pipeline. As a welcome bonus, it can also be transported using existing infrastructure.

"We have functioning gas networks that can be used to enable a low or no-carbon hydrogen future," says Martin Bradley, senior managing director at Macquarie Infrastructure and Real Assets. "Today, heating for domestic properties and industry accounts for half of the UK's energy consumption… There is an obvious opportunity to blend hydrogen into the current natural gas network." ■

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Year in review **Highlights from the past 12 months in the energy transition**

Quinbrook launches US solar platform
Quinbrook Infrastructure Partners made a further investment in US solar by launching Primergy Solar and was preparing to launch a UK-focused vehicle later in the year. Primergy would acquire, develop and operate distributed and utility-scale solar PV and battery storage projects in North America. Quinbrook made the investment through its Low Carbon Power Fund.

'Historic' drop in investment threatens energy transition
Investment in the energy sector – conventional and renewable – had been expected to increase by around 2 percent in 2020, but by late in Q2 expectations were revised to a drop of 20 percent compared with 2019, the International Energy Agency said. That decline translates to roughly $400 billion, which executive director Fatih Birol described as a "historic plunge". Investment in renewables was expected to fall by 10 percent, or $31.1 billion.

IFM Investors commits to net-zero emissions across assets by 2050
IFM Investors committed to reducing greenhouse gas emissions across its assets to net zero by 2050, as well as becoming a net-zero emissions organisation itself. The fund manager said that the commitment is aligned with the goals of the Paris Agreement and builds on the undertaking it made to set emissions reduction targets for its Australian infrastructure portfolio in 2018.

MAY 2020 · JUN · JUL · AUG · SEP · OCT

Australian government de-prioritises wind and solar investment
The Australian government said it would no longer provide funding to wind and solar projects unless in cases of "clear market failure". Clean Energy Council chief executive Kane Thornton said it was "surprising and disappointing" that the roadmap failed to address the barriers to accelerating further deployment of wind and solar, and that the statement was "no substitute for a comprehensive energy transition strategy".

Three key takeaways from the UK energy white paper

The UK government finally released its much anticipated – and much delayed – national infrastructure strategy and an energy white paper, the latter of which was described by Cornwall Insight chief executive Gareth Miller as "the biggest change to the energy markets since the Electricity Act of 1989". A key plank of the white paper was the expansion of offshore wind. It also included a commitment to transition completely from natural gas boilers by 2035.

South Korea's energy transition policies 'insufficient' to meet goals

South Korea's energy transition plan would see a gradual shift away from coal and nuclear generation to gas and renewables, but the shift will fall far below government targets, according to Fitch Solutions. The research firm expected non-hydro renewables – with offshore wind showing the greatest growth potential – to increase from 4.9 percent to 10.8 percent.

Stonepeak targets Asia-Pacific with new $3bn fund

Stonepeak Infrastructure Partners was gearing up to raise a diversified Asia-Pacific infrastructure fund targeting some $3 billion, with a first close expected in Q4. The 12-year Stonepeak Asia Infrastructure Fund will invest in telecoms, transportation, logistics and energy transition, seeking returns in the high teens. A list of anchor commitments was already in the works, with the fund targeting LPs in all markets.

NOV DEC JAN 2021 FEB MAR APR

Brookfield expects impact strategy to grow to $100bn

Brookfield Asset Management's new series of impact funds was expected to grow to up to $100 billion over time, according to chief executive Bruce Flatt. Brookfield's Global Transition Fund, its first impact vehicle, will focus on investments that accelerate the world's transition to a net-zero carbon economy.

Mirova set to target €1bn with fifth renewables fund

French renewables fund manager Mirova was set to launch its fifth renewable energy vehicle, targeting €1 billion in commitments. It would follow broadly the same strategy as its predecessor but would also be able to invest in offshore wind and up to 10 percent in OECD countries outside Europe.

KEYNOTE INTERVIEW

Back to the future with the energy transition

Morgan Stanley Infrastructure Partners' Chris Ortega highlights the value to be found in repurposing legacy assets to support new energy technologies

The outlook for renewable energy infrastructure in the US has never looked more promising, especially now that President Joe Biden's administration has re-joined the Paris agreement and made green energy a top priority. Chris Ortega, managing director and head of Americas at Morgan Stanley Infrastructure Partners, emphasises the importance of investing to support the whole value chain of technologies that will facilitate the transition away from carbon-intensive energy systems – and the infrastructure already in place should be one of the first places to look.

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Q With so many investors putting money into the energy transition, is it possible to take a differentiated approach?

There is clearly a lot of money moving into the space, so we have to think carefully about where the best investment opportunity is. Certainly, with the easiest places to invest – operating wind farms, operating solar parks – returns have been bid down to what I would generally call uninteresting levels for non-core investors, especially in developed markets.

We try to be really deeply thematic in our focus areas. That means we try to understand some of the trends around the energy transition and look for the secondary or tertiary derivatives from those broader trends. In our experience, that is where you start to find a more interesting risk/reward balance.

That means we are looking at where the bottlenecks are with renewables and how we can de-bottleneck. We are looking at situations where there may be some existing legacy assets and asking "how could that be repurposed to support the energy transition?" It also means that we are looking at new forms of energy development and figuring out how we can be an accelerant of

Q Liquefied natural gas is sometimes seen as a 'bridging fuel' that will meet demand while greener systems are developed. Does LNG have a place in a strategy to support the energy transition?

Yes. When we think of how to accelerate the energy transition, reducing coal usage remains a very significant step in that process, especially in Asia-Pacific. And LNG plays a very big role in bringing down coal consumption.

Historically, we have seen LNG re-gasified in large, multi-billion-dollar, landed facilities that replace base load power demand. That is impactful and important and it certainly accelerates decarbonisation, but we are also starting to see more creative uses around LNG, partly driven through technology.

Floating storage regasification units, for example, are much smaller in scale, have a much lower total capex cost than a landed LNG facility and, over time, are potentially mobile. So, sometimes it is more cost-effective for countries with more modest energy requirements to install an FSRU.

These units could also be used not just for base load capacity, but potentially to supply peaking capacity in some countries. In some emerging markets, such as in parts of Asia-Pacific and India, coal continues to be the fuel source when demand ramps up, so making that transition from coal to gas is a material step in the decarbonisation evolution. And FSRUs provide a much faster solution in transitioning from coal to gas.

FSRU Independence, operated by Höegh LNG. Photo credit: Höegh LNG

growth. That doesn't necessarily mean investing in just one project. It could be that we act as a facilitator from a logistical infrastructure perspective to help the full value chain.

Q In terms of de-bottlenecking, where are the greatest opportunities to make an impact?

On the encouraging side, we have seen a nice ramp-up of wind and solar development. But with renewable power, there is the issue of transitioning from what historically has been a hub-and-spoke power generation system and repurposing that for what could be a much more intermodal system.

Renewable development may occur at a utility scale, but it has the potential to be executed at a smaller scale as well. For us, that means looking at solutions that support the transition from a traditional hub-and-spoke system. That could be batteries, that could be microgrids, or that could be improved smart metering.

Where we immediately see an opportunity is around load balancing on a localised basis, especially as more potential supply centres are developed. We may see industrial companies, college campuses, or other facilities having their own microgrids. However, there may be a third party that develops and owns these microgrids as well that assists with storage and load balancing.

Finally, we might start to think of a business model where energy is a service offering rather than a metered consumable. That transformation is something that gets me excited.

Q What is your approach to emerging areas such as energy storage?

Storage is something we are all trying to figure out. The evolution of batteries is on a really encouraging trajectory. The analogy I would give is the evolution of solar PV panels: they started at a really high cost, but over time, through technology, we were able to drive down

costs to help facilitate the much wider proliferation of solar. We are on that sort of curve on the battery side.

What we are trying to do is think through the situation in terms of where cost will end up on a levelised basis and work through some scenarios around the technology, which is still nascent. Our approach is to look for opportunities where there are legacy assets. We try to find opportunities where the battery is a facilitator to help transition power generation from, say, a gas-fired facility to something that has more of a renewable component to it.

Q What are the priority areas for investment to repurpose existing infrastructure assets?

As we think about how we rebase our energy supply, a good place to start is to look at the infrastructure that is in the ground already. We believe there is potential in carbon sequestration and hydrogen, for example, but there is still a lot of work to do in terms of validating technology and bringing down costs. We think part of the solution is figuring out how we repurpose existing infrastructure – specifically pipelines – to serve both of those needs.

Historically, one of the impediments on the carbon sequestration side has been the lack of CO2 logistics. There isn't really a hub-and-spoke network to connect carbon projects to where the sequestration sites will ultimately be located. At the same time, some of the pipelines around our historical natural gas supply centres in the US, like the Barnett Shale in Texas, are now under-utilised.

Existing pipeline operators have been through the work already in terms of securing the right of way, figuring out where these lines should sit, digging the ditch and putting them in place. I think there is a really interesting opportunity in looking at how we could repurpose some of the pipelines, especially in areas where those pipelines are under-utilised.

There would need to be some incremental pipe laid in order to meet the power plant or the refiner where we are trying to capture carbon, but by some studies that would only be 20 percent of the cost of having to build a completely new network to capture and move the carbon. So, if there is an opportunity to reduce the project spend by 70 or 80 percent, to us that seems like a compelling place to spend time hunting for investment opportunities.

Q Do you see opportunities for investing in infrastructure to facilitate the use of hydrogen as an energy source?

Hydrogen has gone from something that was really not front and centre to a very topical conversation over the last year. I think that the potential is very vast on the hydrogen side, but there are still material hurdles. We have made progress regarding the technical feasibility in terms of where hydrogen sits today, though it is still just very expensive.

The work over the next leg of this journey will be figuring out how hydrogen is commercialised in a more cost-effective way. The reason I am encouraged by this is that 15 years ago we were having the same conversation around solar and wind. It will continue to take some time to move to where we are really commercialising hydrogen, but even today, most of our existing natural gas pipelines can blend in 20 percent hydrogen.

So, we want to begin by making thoughtful investments that have exposure to potential hydrogen development and that over time help facilitate the hydrogen industry. But, for us, we want to get that exposure in a diversified way, as opposed to saying, "we know that this one particular hydrogen project is the one that is going to move forward".

"We might start to think of a business model where energy is a service offering rather than a metered consumable"

Q With the offshore wind sector in North America gaining momentum, where do you see possibilities for investing in the value chain?

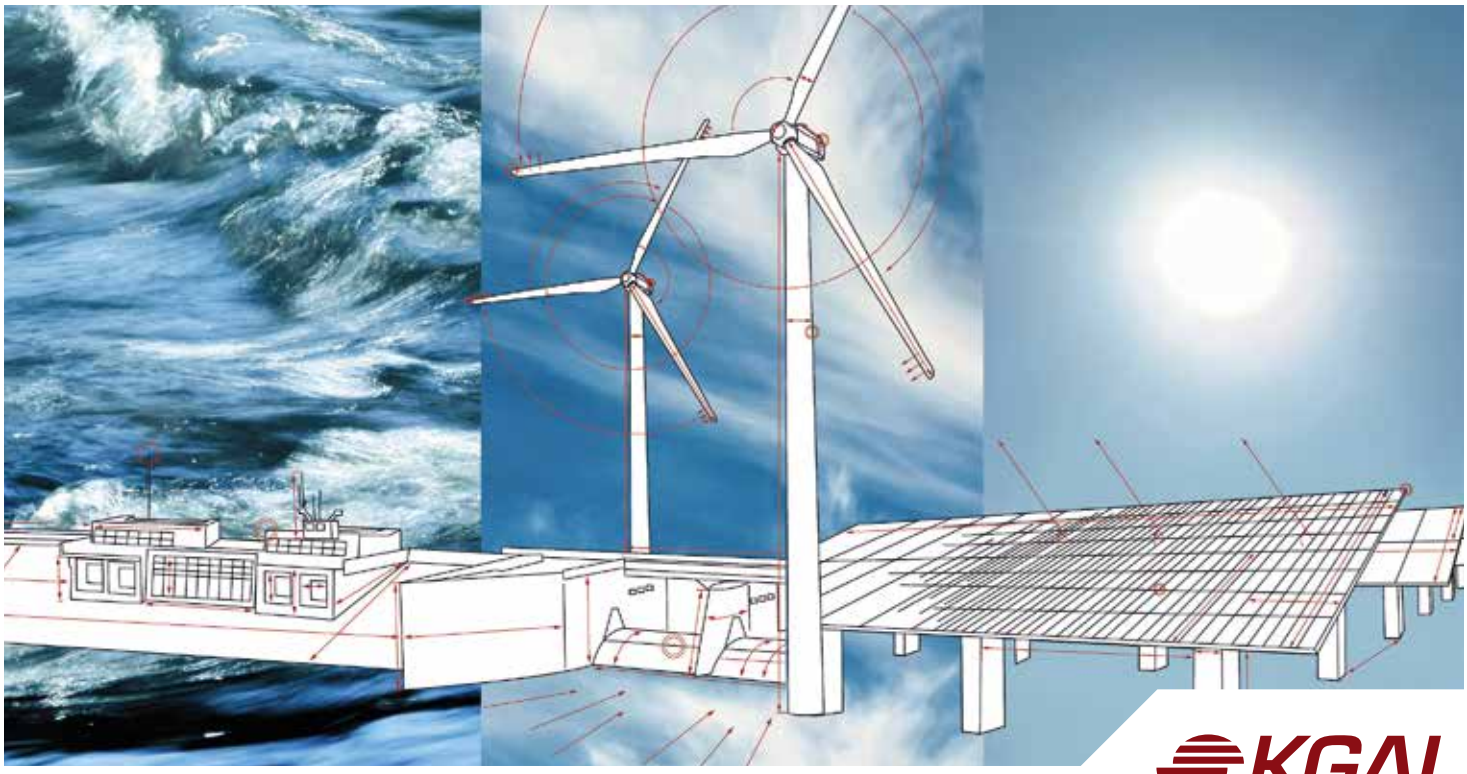
Among other issues, there has been a strong NIMBYism in the US – the phenomenon of local residents not wanting this infrastructure built near them, but in someone else's 'backyard'.

People have been against having offshore wind in places where it would change the views from their homes. But the technology has been evolving and improving, so wind farms can be further out in the ocean.

That is partly why we are starting to see momentum across the Eastern Seaboard and particularly in the Pacific Northwest. Plus, the Biden administration has certainly made it clear that it views the energy transition as an important priority. Again, where possible, we want to help accelerate the development of offshore wind on a regional basis.

So, we are thinking about the broader infrastructure that is needed to develop these wind farms. That could mean strengthening the port infrastructure. It could mean investing in storage facilities for turbines or other equipment.

Another place to look is the vessels that are needed for offshore wind and which might need to be repurposed. Those are the pieces that get us excited because we can be a facilitator for a broader trend. ■



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Sector focus: Electrification

EVs charge towards new opportunities, despite inherent risks, writes Ben Jackson

If public transport has been one of the big losers from covid-19, electric vehicles potentially stand to be one of the big winners.

The onset of the pandemic, and the drastic disruption to normal life that came with the lockdown orders issued around the world, inevitably caused some bumps in the road for companies rolling out EV charging infrastructure. But, more than a year later, the sector is increasingly bullish about its prospects.

In the UK, Zouk Capital is on the brink of reaching its target for the country's first EV charging infrastructure fund. The firm announced in January that it had raised £380 million ($526 million; €445 million) at its third close, just £20 million short of its target. The UK government is matching investments up to £200 million. "Investors are attracted by the opportunity to be part of a mega-trend as the world moves away from fossil-fuelled vehicles," George Ridd, partner at Zouk, tells *Infrastructure Investor*.

Nevertheless, Ridd acknowledges the sector faces a long road to profitability. "Nobody should be thinking you put a charger into the ground and it's profitable from day one," he says. "You need the mass of electric vehicles, a user base behind you and a charging network with sufficient scale to make it work."

Indeed, the scale of the investment required is unquestionably vast. Marco van Daele, co-CEO and chief investment officer at SUSI Partners, told us last year that he estimated up to €100 billion was needed to fund the build-out of EV charging infrastructure up to 2030.

Not all fund managers are enthusiastic about jumping on the EV bandwagon. "Charging infrastructure has too much embedded traffic and obsolescence risk for an infrastructure deal we would like," says Raphaël Lance, head of energy transition infrastructure funds at Mirova. The French renewables fund manager has preferred to invest in companies that install charging infrastructure, rather than operating the infrastructure itself.

Opportunities for EVs

But even as covid brought unprecedented turmoil and raised existential questions for public transport operators, it was also creating opportunities for the EV industry to make the case for investment. "Millions of conventional internal combustion engine vehicles were taken off the road," says Anthony Hadley, head of clean energy for the Americas at AMP Capital. "People got a glimpse of what a clean energy future might actually look like."

As a result, "the e-mobility space today looks not at all dissimilar to solar generation 10 or 15 years ago".

Joe Biden's inauguration in January brought further momentum to the sector. The US president is aiming for all American-built buses, including its iconic fleet of 500,000 school buses, to be zero-emission by 2030. ■

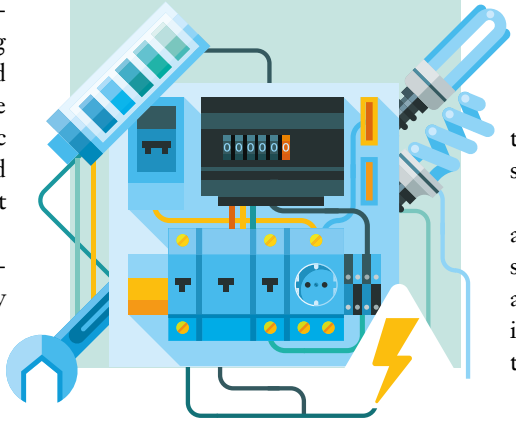
Stories of the year

Investors put EVs in the fast lane

AUGUST 2020
SDCL Energy Efficiency Trust acquires 112 ultra-fast EV charging stations in the UK for up to £50m

JANUARY 2021
Zouk Capital completes its third close and announces £380m in commitments

FEBRUARY
Mirova launches a €1bn renewable energy vehicle and pledges to ramp up investments in non-generating energy assets. Paris-based Andera Partners launches a €200m smart infra fund and targets EV charging



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Sector focus: Energy efficiency

Efficiency stays out of the spotlight, but energy-saving heating investments are attracting increasing attention, finds Ben Jackson

In May 2020, we polled top managers and investors to find out what they were doing about climate change. On the key measure of energy efficiency, we found the answers could be summarised as 'not enough'.

Several of the top GPs and investors declined to detail their energy-efficiency efforts. There were a few honourable exceptions, such as Australia-based IFM Investors, which reported that it was working with domestic electricity supplier Ausgrid to upgrade 60 percent of its 260,000 streetlights to energy-efficient LEDs. On the whole, however, we concluded that the 'forgotten fuel' remained just that, as investors scrambled to put money to work in more visible energy transition ventures.

The pandemic brought more bad news. The International Energy Agency warned in June that it expected spending on energy efficiency to decline by 12 percent in 2020, from the $250 billion invested in 2019. "Investment is not enough to meet sustainability goals and reduce the effort required from energy supply," the IEA noted at the time. It stated that "primary energy intensity" was falling at an annual rate of just 2 percent, far below the 3.6 percent needed to meet climate goals.

Although progress has been disappointing overall, the past year has seen renewed attention on the vital role that efficient heating systems will play in the energy transition.

At our Nordics roundtable in June, Kai Rintala, managing director at Finnish renewables manager Taaleri Energia, pointed out that assets such as data centres are coming under pressure to go "deep green" and "capture the heat they produce and recycle it through district heating".

Then in February, Australia's QIC was one of several firms to acquire a stake in thermal heating business Enwave Energy from Brookfield Asset Management. Christian Schmid, the firm's sector lead for utilities, told us QIC believed "in the potential of distributed energy as providing sustainable, long-term energy solutions to buildings and their operators".

Stories of the year

Investors take tentative steps towards efficiency

MAY 2020
SUSI Partners raises €289m for its energy-efficiency debt fund

SEPTEMBER
French asset manager Acofi Gestion holds a first close on its €120m renewables fund and plans to invest 20% in energy-efficiency projects

NOVEMBER
German asset manager Aquila Capital announces a new energy-efficiency fund

FEBRUARY 2021
Brookfield Asset Management exits from Enwave Energy, a provider of efficient heating systems, in a $4.1bn deal

Using waste to reduce waste

Turning waste of various forms into power could be seen as the ultimate form of efficiency in the energy sector. In December, Greencoat Capital's Jamie Milne explained how the firm's commercial greenhouses in the east of England were using heat generated from local wastewater treatment facilities through the largest heat pump installations in Europe.

Meridiam has also focused heavily on energy efficiency in agriculture. The French firm entered the US biogas market in July with a $35 million investment in a company that produces renewable natural gas from dairy waste. Meridiam partner Elisabeth Hivon described this as a "perfect example of circular economy".

Yet, as we reported in March, the UK's energy-from-waste industry appears to be losing momentum. After achieving strong growth in the early 2010s, heat and power projects using advanced conversion technology have been beset by technical and contractual difficulties. ■

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image courtesy University of Iowa

Meridiam is a Benefit Corporation under French law and supports the UN Sustainable Development Goals

Sector focus: Generation

The American dream edges closer to reality for renewables investors. Yet, as Ben Jackson reports, intense competition threatens to drive down returns

Renewables have had a good pandemic. Around the world, governments seeking to revive their stricken economies and respond to public demands to 'build back better' have adopted investment in green infrastructure as a key stimulus measure. GPs have also enjoyed happy hunting on the fundraising front, with commitments flooding into a host of multi-billion-dollar renewables funds.

Nowhere is the acceleration towards renewable generation more visible than in the US. In July, we reported on the growing trend for European infra managers to venture into the stateside renewables market. London-based InfraRed Capital Partners, which has a large portfolio of renewables assets in the UK and France, is one of many European managers to target opportunities across the Atlantic. The firm's CEO, Werner von Guinneau, told us it "saw an excellent opportunity in the Americas, particularly in the renewables space".

InfraRed was far from the only firm to spot the opportunity. Quinbrook co-founder David Scaysbrook told *Infrastructure Investor* in October that there were "more new entrants coming into the market than we have ever seen before". Investors, he said, were being encouraged by the fact that wind and solar assets "can be built at a fraction of the cost of new fossil fuel plants – even with relatively cheap gas".

That was before the US presidential election provided yet another boost to renewables. Donald Trump had a famously antagonistic relationship with what he called 'windmills' and his administration showed little inclination to support renewable energy operators. Joe Biden, by contrast, took office in January promising a $2 trillion green stimulus.

Stories of the year

Green investors clamour for a piece of the American pie

MAY 2020
Quinbrook Infrastructure Partners launches a US solar platform business

JULY
InfraRed Capital Partners announces North American renewables fund

SEPTEMBER
BP invests $1.1bn in two US offshore wind assets

JANUARY 2021
Greencoat Capital enters the US market with a stake in a wind portfolio

Risk of overheating

Yet there is a risk that the US renewables sector may be close to overheating. With so many projects adding generating capacity, offtakers are enjoying a buyers' market. "It is a great time to be a scale buyer of renewable energy but more challenging if you are a developer," Scaysbrook cautioned. Low energy prices – due in large part to covid-19 – also make the market less attractive for potential developers.

BP joined the rush in September with the announcement of a $1.1 billion investment in two US offshore windfarms being developed by Equinor. The supermajor has been buying up wind assets around the world, including in the UK, as it seeks to capitalise on the energy transition. However, BP's willingness to pay seemingly inflated prices has invited scepticism about its ability to achieve acceptable returns. In March, Patrick Pouyanné, CEO of BP's rival Total, described some renewables valuations as "crazy".

Wind and solar continue to face political opposition, especially in the US. Critics of renewables were quick to capitalise on the widespread blackouts amid winter storms in Texas, noting that 18GW of renewable energy went offline as turbines froze. The same critics, however, were rather quieter about the similar fate that befell natural gas pipelines and some nuclear plants in the state. ■

Sector focus: Storage

The race to develop energy storage capacity is creating growing excitement among investors and policymakers, writes Ben Jackson

The concept of using battery systems to store power generated by renewables has long been seen as critical to allowing electricity grids to end their reliance on gas, coal or nuclear for baseload supply.

The technology is still at a nascent, and costly, stage. However, a report by BloombergNEF estimates that energy storage projects that provide transmission and distribution services will receive $277 billion in investment by 2050 – up from less than $1 billion today. The growth in the market is to be driven by falling costs, with lithium-ion battery costs predicted to drop by 68 percent between 2020 and 2050.

Although policymakers have long recognised the potential role of storage in a fully decarbonised electricity system, governments are only beginning to make detailed plans for storage capacity. In Australia, New South Wales's government published a roadmap in November calling for 2GW of storage capacity to be added to the state's electricity infrastructure by 2030. Germany aims to install a 500MW battery in the southern town of Kupferzell by 2025 – double the size of the world's largest operational battery, which was unveiled in California in August.

Infra investors are also showing growing interest in entering the storage market. "Batteries are going to change the pricing and value of electricity," says David Scaysbrook, co-founder of Quinbrook Infrastructure Partners. Along with solar, he says batteries represent "the most significant shift in power markets since the second world war". *Infrastructure Investor* reported in November that Quinbrook's UK-focused renewables fund would target solar and wind assets that have battery storage capabilities attached.

Singapore's Equis has been active in the Asian batteries industry and completed an exit from South Korea's largest storage system in November. The firm told us it would seek to integrate battery storage within the design of every generating asset in its portfolio and develop "standalone battery storage solutions to assist grid operators to reliably manage the supply profiles of renewable energy generation".

Batteries running low

However, the actual volumes invested in battery storage systems have been surprisingly static. The International Energy Agency reported in June that investment in battery storage had declined by 12 percent in 2019, though the dip is partly explained by falling costs. IEA figures also showed that investment in battery storage stood at less than 1 percent of the value of investment in generation assets.

Even so, given the potential impact on global energy systems that effective storage systems would deliver, the industry's evangelists are advising investors to enter the market before the trickle of dollars becomes a flood. Laurent Segalen, managing partner at advisory firm Megawatt-X, said at our online global summit in October: "You should start investing now and learn because there's a lot of learning to be done… If you wait three, four or five years until everything is mature, the catch-up will be too big." ■

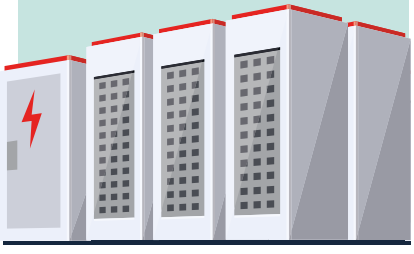
Stories of the year

Batteries continue to attract investment

AUGUST 2020
The world's largest battery storage project comes online in California, with capacity of 230MW

SEPTEMBER
Ardian Infrastructure and Enel sign a deal to invest in 10 battery projects in Canada

NOVEMBER
New South Wales unveils a roadmap calling for 2GW of storage capacity by 2030. Equis sells South Korea's largest storage system to Kiwoom Asset Management



KEYNOTE INTERVIEW

The human impact of the energy transition

Instar president and chief executive officer Gregory Smith and InstarAGF partner Jonathan Stone say this promise of a greener future requires as much focus on the transition itself as the final net-zero carbon outcome

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Q How has covid impacted the global shift towards a climate-conscious economy?

Gregory Smith: The trend towards sustainability has been going on for a number of decades, affecting the way we think not only about energy generation, but about community design, transportation and other aspects of daily life.

Recently, we've seen first-hand the dramatic impact of the pandemic on existing trends, such as the rapid acceleration in technological adoption. The thinking around climate change and sustainability has similarly accelerated, with a recent report by Preqin revealing that nearly 80 percent of alternative investment managers anticipate a substantial increase in current ESG practices by 2025.

A major factor driving this shift towards a climate-conscious economy is grassroots support, which in turn breeds support from governments. Over the past year the dialogue regarding sustainability in the public and private sectors has increased dramatically, and it is this rate of change that has been most remarkable. The progress we're seeing across North America reflects what we would have seen in around six years of sustainability initiatives, condensed into just six months.

Jonathan Stone: We find ourselves at a critical juncture for the energy transition. The nature of the pandemic has fundamentally changed our understanding of 'business as usual', resulting in greater demand for innovative solutions to meet our local and environmental needs.

Achieving the goals of digitisation, decentralisation and decarbonisation for the energy sector will involve a holistic overhaul of all our systems. It will require collaboration across governments, corporations and individuals to ensure equal access and opportunities in a transitioning industry.

Q Achieving a net-zero carbon future is a laudable

goal. What are the challenges to reaching this milestone?

JS: There is an interesting challenge around the public perception, and often misconception, of fossil fuels. While it may seem counterintuitive on the surface to bring fossil fuels into the conversation, these traditional energy sources have a critical role to play as we balance the shift to lower-carbon energy sources with meeting growing global demand for energy.

By 2050, the year targeted by the Intergovernmental Panel on Climate Change for countries to reach net-zero emissions, the US Energy Information Administration predicts that the nation's energy generation mix will only be 42 percent renewable, leaving the majority of the supply to be supported through traditional sources.

Reliably transitioning to a low-carbon economy while meeting essential energy needs means that the role of fossil fuels is evolving, as it should, but not going away entirely. Supporting the sector as it undergoes transformational change will help introduce new opportunities for these traditional businesses, customers, investors and communities.

GS: There is also a large misconception around what 'green' energy is and what will have the biggest environmental impact. We are very supportive of net-zero carbon and are working hard across our portfolio to ensure a net-zero carbon future for our companies, but it is important to dive into these deeper questions, looking at the impact across the whole lifecycle of an energy project.

Where are the raw materials and parts coming from? How are you getting those materials and parts from where they are produced to their ultimate destination? What are the waste implications when the project comes to the end of its useful life?

You need to consider the energy consumption footprint and carbon intensity of a project from construction to decommissioning for a real picture of what is happening.

Q How does community engagement work in practice in an energy transition context?

GS: All infrastructure projects come with a uniquely human impact. We are very proud of our work with First Nation groups during the design, construction and operation of the Okanagan Wind platform in British Columbia, for example. Not only were the communities highly supportive of the project, but we ensured 40 percent of construction contracts went to First Nations-backed businesses. That meant we were creating jobs for those communities throughout the construction and operational phase. Notably, we also created an impact benefit agreement, including a scholarship programme and work in schools to help educate children around renewable energy. We worked in collaboration with the First Nations leaders and that is a great example of how to engage with communities.

Q What are the most interesting investment opportunities emerging from the energy transition?

GS: One of the areas I find very interesting at the moment is bioenergy, including landfill waste-to-energy, as well as animal waste-to-energy. That is going to be critical to preserving the agricultural ecosystem, as the urgency around food and water security intensifies.

Going back to the idea of viewing energy lifecycles holistically, bioenergy has an important role to play. It ties in well with other technologies – such as run-of-river hydro, wind and solar – in that it provides reliable baseload. It is a key part of that energy supply mix that can be used to balance the overall grid.

JS: Leveraging agricultural and post-consumer waste to close the carbon cycle and produce more energy is a really exciting opportunity. But to fundamentally change energy systems in this way, you need to build the infrastructure required to ensure the system is stable.

A good example is what happened in Texas during its atypical cold snap in February. Natural gas plants, utility-scale wind turbines, coal and nuclear plants all began to fail either because they lacked the resources necessary to keep them online during low temperatures or were in low power mode to coincide with the typical low demand at that time of year.

There is a strong need and opportunity for investment in battery storage

and microgrids, digitised and decentralised solutions to provide the balance and efficiency required as energy demand continues to grow.

GS: District heating is another decentralised form of energy that is interesting and provides reliable solutions for communities. It balances the need for industrial and commercial heating and cooling during the day with the requirements of residential housing at night. We often think about energy in terms of fuelling cars, trains, boats and planes, but improving the carbon footprint of our cities is just as important as the movement of people and goods across the economy.

Q When you look at potential investments in the energy transition, why is it important to incorporate all elements of ESG initiatives, rather than focusing purely on the environmental impact?

GS: Each individual element actively influences the other. We often say that ESG should be renamed GSE: if you get the governance right, fully taking social and stakeholder impacts into account, it follows that you will be making the right choices around the environment.

The same can be said for social initiatives. Infrastructure provides communities with essential services, touching everyone's lives every day, from the moment you switch on the light, to getting in the car – or taking public transport – to get to work. So, the starting point for us when we look at ESG is ensuring we have a corporate social licence to operate. That community support allows us to build broader public support, making it easier to work with governments to ensure the right regulations and policies are in place to deliver sustainable infrastructure solutions.

Within energy transition projects specifically, the concept of a just transition is deeply embedded in the Paris Accord and foundational to our investment approach, which aims to enrich people's lives. As we shift from a carbon economy to a renewable economy, responsible investment and development in the energy transition means considering all areas of impact, including the very real social consequences for families and communities. We must balance the environmental risks and benefits with social and stakeholder impacts, otherwise we are not doing our job as a society or as good corporate citizens.

> *"Improving the carbon footprint of our cities is just as important as the movement of people and goods across the economy"*
>
> **GREGORY SMITH**

> *"By 2050… the US Energy Information Administration predicts that the nation's energy generation mix will only be 42 percent renewable"*
>
> **JONATHAN STONE**

Q What does the future hold for the energy transition and the role of infrastructure managers within it?

JS: I am excited about how we can contribute to societal change that is positive for everyone. We are proud to be a signatory to the United Nations-supported Principles for Responsible Investment, an organisation that helps establish global best practice for investors and asset managers. But equally, we are excited about the initiatives being taken at a portfolio company level.

Our management teams are keen to contribute to their communities and are finding meaning in that. Those initiatives may be small in themselves, but they have an important ripple effect.

It is a tough challenge that we are facing as a world, and it will require everyone to play their part. But I am excited about how small changes at the investment, asset management and community levels can have a big impact in connecting people, creating socioeconomic opportunities and elevating industry best practices.

GS: Infrastructure is going to have a critical role to play as we move beyond the pandemic – not just in terms of boosting growth and creating jobs, but in contributing to the climate-conscious economy that is emerging and in engaging with the communities that infrastructure is there to serve. The asset class has certainly come a long way and is ready to step up to this challenge.

The focus is no longer on measuring and benchmarking our contributions to the energy transition, but on sustainable action to combat climate change and drive societal benefit.

The innovation and creativity we are seeing are what excites me. That is what will ultimately deliver lasting change. ■

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Global investment in the energy transition

Investment in low-carbon energy projects topped $500bn in 2020

Last year, global investment in the transition to low-carbon energy sources totalled $501.3 billion, breaking the $500 billion barrier for the first time. This compared with $458.6 billion the year before and just $235.4 billion in 2010, according to figures from BloombergNEF.

That $501.3 billion included investment in renewable power, energy storage, EV charging infrastructure, hydrogen production, and carbon capture and storage projects. It also included end-user purchases of low-carbon energy devices.

Just over 60 percent of the total – $303.5 billion – was invested in renewable energy. That was up 2 percent on 2019, despite covid-related delays to some deals. The next-largest sector was electric transport.

No country invested more in the energy transition than China which, despite a drop of 12 percent, saw investment of $134.8 billion. The second-biggest country in terms of investment was the US with $85.3 billion, which represented a decline of 11 percent.

European countries drove much of the growth. Europe's combined investment of $166.2 billion was 67 percent higher than it had been in 2019 and greater than either the US or China. ■

$303.5bn

renewable energy attracted more capital than any other sector

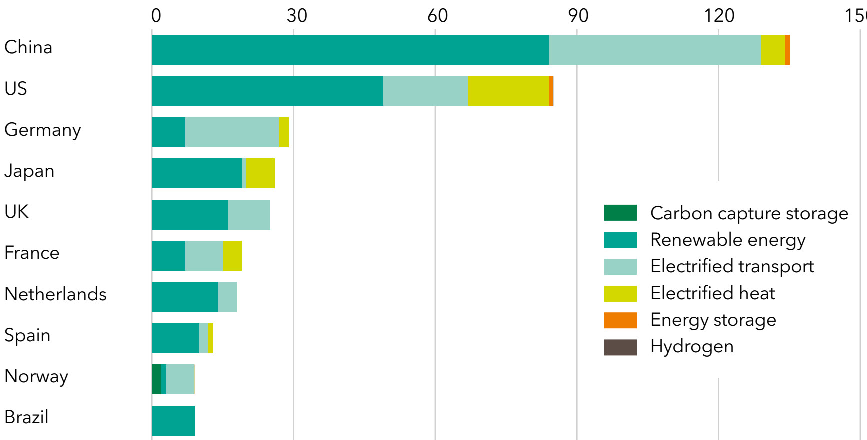
$139bn

electric transport was the second-biggest sector

Global investment in the energy transition by sector ($bn)

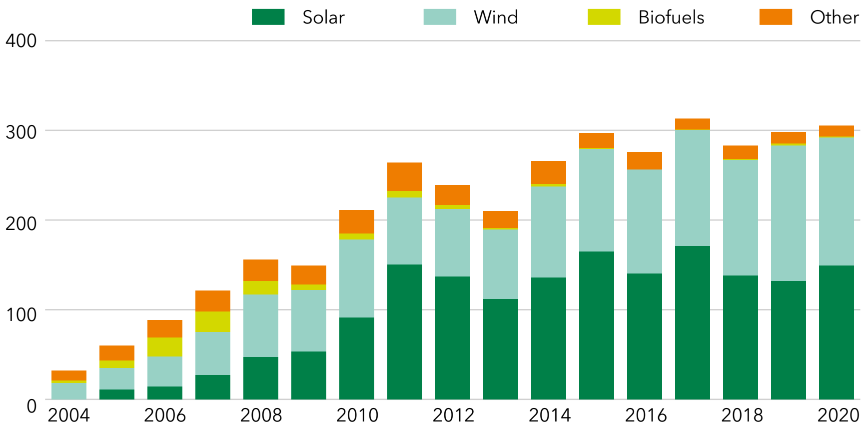
Source: BloombergNEF

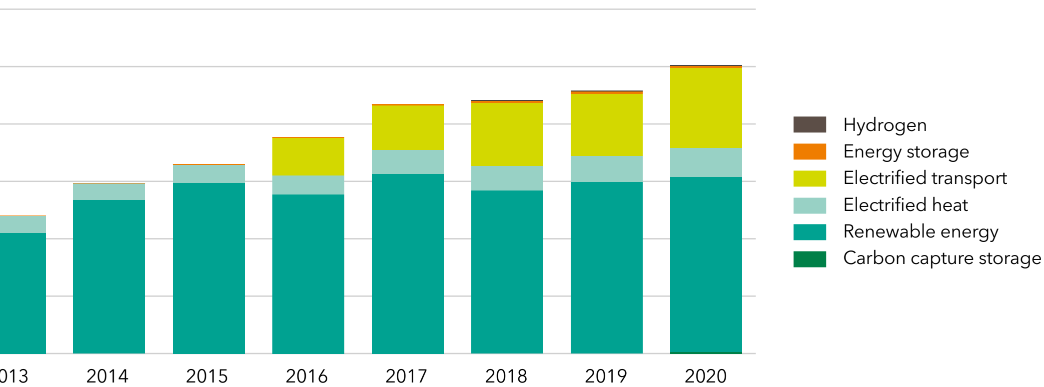
Global investment in the energy transition by country ($bn)



9% year-on-year increase in energy transition investment

Global new investment in renewable energy by sector ($bn)





$501.3bn

global investment in low-carbon energy transition

KEYNOTE INTERVIEW

Tackling 'the defining issue of our time'

The energy transition market has been around for decades, but it has really picked up steam over recent times. Mikael Karlsson discusses how this is translating into opportunities in the hard assets space

Renewable sources of power are clearly here to stay and have massive growth potential as the world attempts to meet the Paris Agreement targets. Yet they also have a very specific role in many emerging markets, where power is often unreliable and used inefficiently because of ageing networks, buildings and machinery, and the remoteness of some populations.

Mikael Karlsson, partner and head of energy and infrastructure at Actis, discusses how renewables and the technology required to make these sources of power work on the grid are developing and what kinds of opportunity are becoming attractive in this rapidly changing space.

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Q How does climate change play into your investment themes?

Climate change is the defining issue of our time, with global temperatures at the highest they have been for 3 million years. The world will need to decarbonise rapidly, and a full-scale energy transition is necessary if we are to have a sustainable future.

The power sector accounts for a third of current emissions, and two-thirds of this comes from thermal power. There will need to be around $130 trillion of investment by 2050 in the energy sector if we are to meet the Paris Agreement goals, and renewables will be a very big portion of this.

Clearly, this is an important factor in our investments. Renewables contribute to the vital task of tackling decarbonisation at speed and they also meet investors' need to incorporate responsible investment in their portfolios. Our investors often have long-term investment horizons and if you are, for example, a pension fund for teachers, the police or firefighters, there is a need to contribute to making the world a better place alongside a good financial return.

Yet there are also economic drivers.

The cost of renewables has declined by around 80 percent - 90 percent for solar and 60 percent for wind - since 2010, and it continues to do so. They are the cleanest and quickest sources of energy to install – you can get a solar project operational within a year.

Finally, as investors we always look at the environment we are operating in. If you take India as an example, there are 17 or 18 cities that feature in the top 20 most polluted places on the planet – much of that is the result of coal-fired power stations and inefficient combustion engines. Air quality and local impact are also powerful contributors to the energy transition.

Q How is the energy transition developing in your markets?

Renewables have been – and will continue to be – a significant part of the transition. In non-OECD markets, $14 trillion will need to be invested to meet power demand over the next 20 years – that is equivalent to $1.7 billion a day.

Our markets benefit from strong solar irradiation and winds, which give renewable wind assets the potential to generate three times European capacity. This offers a significant investment opportunity. Yet the opportunities go beyond simply installing plants linked to the grid. There is an increasing market for selling clean energy to private buyers in areas such as South America.

One of our portfolio companies, Atlas, has secured significant contracts with consumers and industrial businesses to supply renewable power directly to them. This is a part of the market that will continue to grow as companies worldwide increasingly seek to comply with Paris Agreement goals – we have already seen this with Amazon and Google, for example.

Distribution businesses also have a part to play. We have invested in 15 power companies, including 10 renewable energy platforms, but we have also invested in distribution companies for many years.

"The cost of renewables has declined by around 80 percent... since 2010, and it continues to do so. They are the cleanest and quickest sources of energy to install"

Here, we can make a significant impact from an environmental perspective because we can invest to reduce losses in the system – and in some parts of the world these are material. By investing in the best-in-class tools and upgrading grid networks, we can reduce losses, which reduces the cost of energy and has clear environmental benefits.

There are also around 1 billion people around the world who lack access to power – the majority of these are in Africa. Many are in remote locations and therefore far from the grid. It is often not cost-effective to build networks to these customers and so there is an emerging market in mini-grids and off-grid solar. As solar power and battery prices are declining, this is becoming a commercially viable proposition.

Technology solutions are also emerging that allow energy companies to manage their assets and ensure they receive payment from often very remote customers. This market is set for growth over the coming years.

Q What role will gas play?

Gas will have to be part of the mix through the energy transition, particularly as energy demand is rising, with 70 percent of demand occurring in emerging markets by 2040. Renewables offer intermittent supply, and so there need to be solutions that maintain reliable grids.

It is really important that stakeholders focus on the practical energy transition pathway for each country or region that they focus on. Clear attention on the decarbonised end goal, as well as the route towards it, will help to focus priorities and to enable clear frameworks against which the private sector can invest.

Back in 2003, Globeleq, a power business we established, acquired Songas in Tanzania. The country had

Q Can you give us an example of the energy transition in play in your markets?

Zuma Energia is a good example. Our investment created one of the largest renewable independent power producers in Mexico by building and aggregating the country's most competitive projects – Reynosa, the largest wind farm in Latin America Santa Maria and Orejana – into a single 818MW platform.

It neatly illustrates how far the technology has come, too. When we invested in our first wind farm in Latin America in 2009, PESRL in Costa Rica, it used 410KW turbines and had a total capacity of 24MW. Our latest wind farm in Brazil offers 10 times that capacity per turbine, at 4.2MW.

This, along with the lessons we have learned over the years, allows Zuma to sell power at half the price. These cheaper units of power have a significant impact on economic development and offer a sustainable energy source: Zuma has contributed to the avoidance of almost 2 million tonnes of carbon.

long wanted to use its own supplies of natural gas to generate power as an alternative to more expensive oil and so, through our investment, Globeleq was able to convert the MW Ubungo power plant from oil to gas, saving the government $5 billion of precious FX reserves that it would otherwise have spent on commodity imports.

Q And what about other solutions to renewable intermittency?

A key question in the transition to renewables is how to manage their intermittency and ensure reliable sources of power. By 2030, there will be a ten-fold increase in renewable deployment.

There is a growing and exciting storage opportunity across our markets. Storage can be particularly transformational where grids are more fragile and the challenge of integrating intermittent renewable power greater.

Batteries will play a key role here, especially as the world moves to electric vehicles, which will be cheaper, easier to build and, clearly, cleaner than traditional combustion engines. We need to create enough storage to manage the intermittency of renewables and this is likely to come from standalone batteries or from batteries in electric vehicles that can be used for the dual purpose of taking or giving power to the grid depending on the needs of the grid and the vehicle.

The price of batteries has reduced substantially recently, and this will continue. It is no longer a limited technology, but a competitive, mature enabler for the energy transition. One of our portfolio companies, Lekela, a pan-African renewables platform, for example, is conducting a feasibility study into creating Senegal's first grid-scale battery electric storage system.

A little further out, hydrogen will become more viable. If we can use excess power generated when the sun or wind are strong to create green hydrogen, this will be a big step forward. It is possible currently, but it is expensive and there are some technical constraints. It could be used for power but also for transport, such as aircraft and ships, which move far away from energy sources.

Q Some of these technologies, such as batteries, wind turbines and solar plants require rare earth metals. How do you manage the supply chain for these kinds of material sustainably?

We have to engage with suppliers to understand the due diligence they undertake – we need to be able to manage risk and ensure critical metal supply can be appropriately traced. Our responsible investment team works closely with us in the energy operations team to examine the policies, codes of conduct and supply chain management processes in place.

Q How does infrastructure overlap with other sectors on the energy transition?

We work closely with other teams, and particularly with the real estate team. Developments and buildings combined account for nearly 40 percent of global carbon emissions. One area that has been accelerated by covid is digital transition, which increases demand for data centres. These are obviously energy-hungry and so we have been working with our real estate colleagues to help them source clean electricity.

We are also creating Nigeria's first solar-powered shopping mall, the Jabi Lake Mall. Here, we are installing a 600KW rooftop solar plant that will sell electricity to the mall through a 15-year power purchase agreement and this will reduce its carbon emissions by over 13,000 tonnes. This follows the success of the largest solar car port in Africa, which we installed at Garden City in Nairobi.

Yet power supply is only part of the equation for real estate. Our firm takes a 'green by design' approach to investments that meets both commercial and environmental investment objectives by reducing energy consumption through the use of reflective materials, energy-saving lighting, insulation and so on. For example, we have built the first internationally certified green commercial buildings in Nigeria, Ghana, Kenya and Cameroon.

> *"There will need to be around $130 trillion of investment by 2050 in the energy sector if we are to meet the Paris Agreement goals"*

Q How do you see the energy transition creating further investment opportunities over the coming years?

We are active in markets that are home to 85 percent of the world's population. In many of our markets, a lack of reliable power supply also remains a barrier to economic growth. So, we are investing in places where this really matters and where we can make a difference.

The biggest role we have is mobilising more capital towards this area — and we can do that by demonstrating that it is possible to generate compelling returns through energy transition investments while working sustainably to create shared value with local communities. The energy transition has moved up the agenda for investors over recent times, but it is something we have been investing in for many years. ■

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- We believe capital can and should be transformational for the countries, cities and communities in which we operate
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- We believe this impact should be measurable which is why we created the open source Actis Impact Score™
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Offices

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Global investment: Beyond renewables

Investment in electric transport, energy storage and hydrogen remained strong in 2020, despite covid-19

Outside the renewables sector, the energy transition also remains promising. Storage benefitted from the world's biggest batteries being commissioned, including in California and China. Passenger electric vehicles kept electrified transport moving, and hydrogen looks set for strong growth.

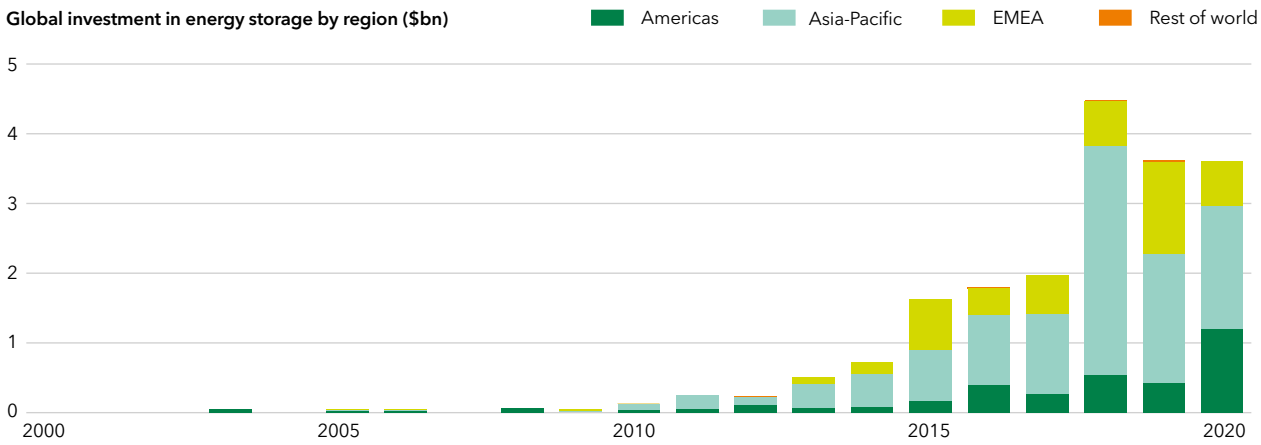
There was $3.6 billion committed to energy storage in 2020, according to BloombergNEF figures. China, South Korea and Japan invested the most, with $1.8 billion committed between them. There was record investment in the Americas at $1.2 billion. But after a record year in 2019, investment in Europe slowed to $600 million.

Passenger electric vehicles accounted for the majority of outlays on electrified transport, totalling $118 billion. Although the passenger EV market has quadrupled in size since 2016, the electric bus market has roughly halved in the same time. Commercial EV investment has also fallen sharply, largely due to the decline in upfront costs and changes in developed economies as the market shifts from long-haul, heavy-duty commercial vehicles towards cheaper medium- and light-duty ones.

Investment in hydrogen was nearly $1.5 billion, around 20 percent less than in 2019. ■

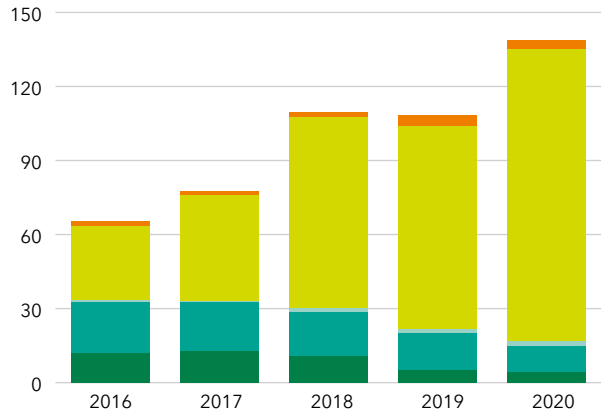
$8m energy storage investment grew modestly on a global scale...

$1.2bn ...that growth included record investment in energy storage in the Americas



Note: Stationary energy storage projects only; excludes pumped hydro, compressed air energy storage and hydrogen projects; hydrogen projects are accounted for elsewhere in the report
Source for all data: BloombergNEF

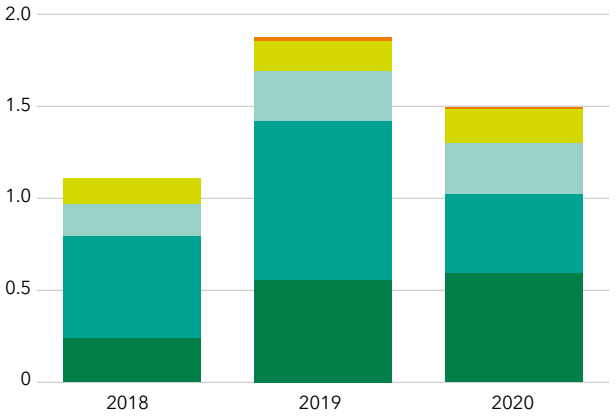
Electrified transport investment by category ($bn)



Note: includes investment in vehicles and charging infrastructure; 2020 investment numbers are based on preliminary EV sales data; totals include estimated vehicle prices; excludes two- and three-wheelers; BloombergNEF data does not capture private charging investment for commercial vehicles

20% hydrogen investment declined by a fifth

Global investment in hydrogen by category ($bn)



Note: not all electrolysis systems included necessarily use clean electricity; refuelling stations do not necessarily supply clean hydrogen, and vehicles do not necessarily use clean hydrogen

1/130th investment in hydrogen-fuelled vehicles trails a long way behind electric vehicles

99% China accounted for almost all electric bus sales between 2016 and 2020

Updates

the passenger electric vehicle market is four times the size it was in 2016

ROUNDTABLE

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Renewables benefit from the world's determination to build back better

Despite huge pent-up appetite for development, governments will struggle to deliver on their energy transition promises unless permitting delays are overcome, four infrastructure professionals tell Amy Carroll

Renewable energy has been a surprise success story during the dark months of the pandemic. At a time when the world could easily have let the climate change agenda slip down the priority list, global commitment to the energy transition has, in fact, gained fresh momentum. Even as many markets teeter dangerously on the brink of third waves of the coronavirus, governments are united in their determination to build back better and greener.

"In many ways the sector has benefited from government recovery programmes that are designed to support the transition to a sustainable economy," says Daniel von Preyss, executive director and head of private equity and infrastructure at Impax Asset Management, during *Infrastructure Investor's* latest renewables roundtable.

Covid-19 appears to have brought a fresh focus on all aspects of environmental and social awareness, and LPs' appetite for renewables has intensified.

"I would say that 2020 was the most successful year for renewables fundraising to date," says Jeff DeBlock, partner at CBRE Caledon. "Combined with a lack of correlation to GDP and the continued technological improvements that are making renewables more and more competitive with thermal methods of generating electricity, this renewed emphasis on building a sustainable future has contributed to the ongoing success of the sector."

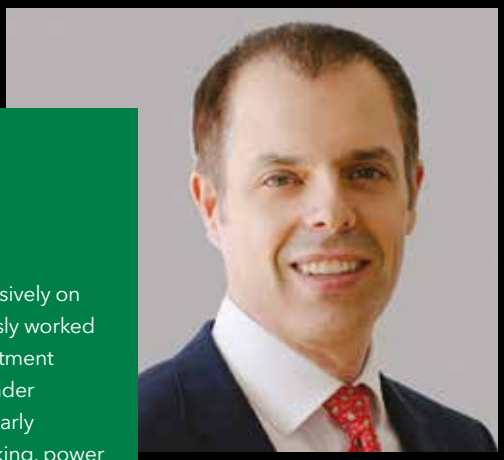
Of course, the renewables industry has not been immune to the devastation covid has wreaked. In some countries, electricity consumption dropped markedly last year because of the severity of lockdowns. This had a negative impact on pricing, explains Kai Rintala, managing director at Taaleri Energia, who cites Spain as one example. He adds, however, that significant EU stimulus packages slated for energy transition initiatives, including the electrification of transport systems and EV charging networks, should cause prices to rally over the medium term.

Michael Ebner, managing director at KGAL Investment Management, says that although increased merchant risk in the renewables sector means pricing volatility is not immaterial, the prevalence of PPAs means it is the

Daniel von Preyss

Executive director and head of private equity and infrastructure, Impax Asset Management

Von Preyss joined Impax in 2009 and has primary responsibility for the firm's investment in the renewable energy sector. He also heads the asset management function. Before joining Impax, he was responsible for Northern European infrastructure activities at Babcock & Brown, where he focused on regulated utilities, gas storage and broader power generation.



Jeff DeBlock

Partner, CBRE Caledon

DeBlock joined CBRE Caledon in 2012 and is focused exclusively on the firm's infrastructure investment programme. He previously worked in the infrastructure group at the Canada Pension Plan Investment Board. During his tenure with CPPIB, infrastructure assets under management grew from a few hundred million dollars to nearly $10 billion. DeBlock has also worked in the investment banking, power and utilities group at BMP Capital Markets.

Michael Ebner

Managing director, KGAL Investment Management

Michael Ebner has been a managing director of KGAL Investment Management since 2015, having built up the infrastructure team since the firm's inception in 2007. He is also responsible for human resources, structuring and marketing and communications. Ebner previously worked at both Dresdner Bank and Bayerische Vereinsbank.

Kai Rintala

Managing director, Taaleri Energia

Rintala has more than 15 years of experience in the infrastructure industry. Before joining Taaleri Energia, he worked for KPMG in Helsinki and London, advising public and private sector clients on infrastructure strategy and transactions across energy, transport and social infrastructure. He has executed 900MW of wind transactions, as well as transactions in hydro power, electricity distribution and decentralised heat services.

creditworthiness of the offtaker that is the major concern.

Other challenges presented by covid have included delays to construction, and delays to permitting caused by difficulties in bringing stakeholders, such as landowners and local mayors, together for meetings. "It has not been all plain sailing," says von Preyss. "Nonetheless, I would say we are coming out of the pandemic stronger than ever, given governments' support designed to accelerate the transition."

Permitting problems

It is clear that the political will is there, underpinned by an increasingly climate-conscious electorate. The capital, too, is ready and waiting to be deployed. Yet systemic roadblocks are still preventing the pace of development from keeping up with both interest from the market and governments' increasingly ambitious renewables targets.

The chief issue, it appears, is with permitting. "Getting a permit, particularly in the wind sector, is far more complex today than it was 10 years ago," says von Preyss. "The regulation around environmental impact has strengthened, and rightly so. But really it is often the small groups of interested parties with objections to projects that are causing the delays – for example, people complaining it impacts the view from their terrace. That doesn't usually prevent the permit being granted but it does mean that everything takes longer."

It is a serious problem and one that governments are trying to address. In Germany, local communities now receive a levy from wind farm projects, and that has led to a clear shift in attitudes. "Local mayors that may once have been neutral are now actively lobbying in support," von Preyss says.

Ebner agrees permitting is causing delays of around 12 months on average: "As a result, almost no market within Europe has hit its targets for renewable generation over the past year and the future doesn't look much better because of this pervasive nimby mentality. If that doesn't change, appetite from investors will continue to exceed the supply of projects which, from an asset class perspective, will put pressure on returns. Crucially, from a global perspective, meanwhile, governments will not be able to reach their climate change targets."

"The political intent is there," says von Preyss. "We have the money and we know how to employ it. But we are lacking a permitting structure that provides the certainty we require in order to fulfil what government, and the public, has tasked the private sector with achieving."

Regional differences

Of course, the permitting situation varies from country to country. Rintala points to Finland, where the permitting

> *"If you are going to invest in intermittent technologies, such as wind and solar, it is impossible not to be looking at battery storage and other storage solutions as they continue to develop"*
>
> **KAI RINTALA**
> **Taaleri Energia**

"We are sometimes left scratching our heads with some of the aggressive pricing that we see… I find myself bewildered by the risks some investors seem willing to accept"

DANIEL VON PREYSS
Impax Asset Management

environment has improved dramatically since government subsidies were withdrawn.

"Now you can generally get projects through without any appeals," he says. "Texas is another example of a market where permitting is straightforward. In the Eastern European markets where we are active the general public tend to be very pro-wind and solar because of the obvious environmental and cost benefits and also because it brings income to the local authorities where the wind and solar farms are located."

A relaxed approach to permitting is not the only indicator of an attractive market. Although a liberal approach to permitting signals a region's desire to be business-friendly, DeBlock says the contracting environment is as important as an open door. And, again, Texas is in the spotlight.

"In Texas, you often have to obtain a corporate PPA or hedge with an investment bank or trading house, and so you are exposed to that risk," he explains. "Texas is very friendly from a development perspective, but there are real risks on the operational side."

Ebner is sanguine about merchant risk. "We may talk about the good old days of feed-in tariffs, but that subsidised environment carried regulatory risk, quite extreme regulatory risk in some countries," he says. "Today, that regulatory risk has abated. Yield assessment risk has reduced and technical risk has reduced as well. Merchant risk, on the other hand, has increased. There is an equation that every investor has to consider when deciding whether the returns on offer in a particular deal are fair."

Furthermore, a tolerant permitting environment may lead to a market becoming overwhelmed. "If the permitting process is too easy, the market may be flooded and there are only so many offtake arrangements available at any one time," says von Preyss. "If too many PPAs are being sought, you will either struggle to obtain one or the pricing will be unattractive."

March of the oil majors

Yet although competitive dynamics are important at a local level, the roundtable participants are confident that, globally, there is more than enough opportunity to go round.

"Just look at the growth targets for renewables," says von Preyss. "There is an awful lot of capital that can be absorbed. The volume of dealflow we see on a daily basis is enormous. However, it is all about picking the projects

that are right for your risk/return profile. We may compete with other infrastructure managers when fundraising, but we rarely meet each other in the market."

What does surprise von Preyss, however, is the level of risk some investors, often with limited experience of the sector, seem willing to take: "We are sometimes left scratching our heads with some of the aggressive pricing that we see. If you are focused on operating assets that are well-managed, well structured, with perhaps 15 or 20 years of secured offtake, it is easy to see how that can become a bit of a cost-of-capital shoot-out. But when you are dealing with late-stage development and permitting risk, the situation is completely different, and I find myself bewildered by the risks some investors seem willing to accept."

However, it is not just other private markets managers that are playing in this space. DeBlock says his firm also comes up against listed specialists and strategics. "There is room for everyone, but financial investors need to remain disciplined for their LPs," he says.

The oil majors are, of course, also getting in on the act. "We don't have the financial resources of the oil majors so we need to play to our strengths," says Ebner. "We have to be quicker on our feet and we sometimes need to go deeper into the market. We have to build relationships rather than just write large cheques. That, after all, is why LPs pay us our fees."

Rintala agrees, adding that this is why he believes the mid-market offers the most attractive renewables opportunities. "Once you get into the bigger-ticket deals, returns have a tendency to collapse down to the lowest cost of capital, which is why we focus on a €30 million-€50 million sweet spot," he says. "We know that is the space where we can be at our most nimble and most competitive. The entrance of the oil majors into the renewable energy sector effectively underlines that point."

Furthermore, the oil majors tend to

"2020 was the most successful year for renewables fundraising to date"

JEFF DEBLOCK
CBRE Caledon

The return of solar

"Solar has returned to Europe," says von Preyss. Indeed, solar represents around 50 percent of Impax's latest fund, as opposed to just 5 percent for its predecessor.

Retroactive reductions in Spanish solar tariffs in the middle of the last decade left many investors burnt. Similar stories played out in other markets, including Italy and the Czech Republic.

"Now the market is back, for the simple reason that solar has become cost-competitive," von Preyss explains. "The costs are now around 10 percent of what they were 10 years ago, when everyone was busy building in Spain."

Rintala is also bullish on solar in selective markets. "We are active in Texas, in Spain and in Greece," he says. He adds that returns were higher in Greece because of the greater complexity required in a less developed solar market.

"Solar has come of age," adds DeBlock, explaining that his firm had particular success with smaller-scale community solar projects in North America. "Solar has become competitive with conventional forms of electricity generation. Opportunities are plentiful. It is just a matter of sizing them up and finding the appropriate risk/return profile."

Ebner sounds a word of warning, however. "Everyone loves solar because it is low risk," he says. "But that often means prices are high and returns under pressure." He also explains that site availability is an issue in some markets. "In Germany, for example, it is almost impossible to build out solar to targets because the sites just aren't there."

focus on the offshore wind market, as do the big utilities. "That is where returns are getting particularly tight," says von Preyss. "We, on the other hand, tend to focus on the more fragmented onshore market where projects are smaller and you can still generate good risk-adjusted returns."

Where next?

Certainly, LPs do not appear to have been deterred by the crowds gathering in the renewables space. Indeed, appetite is voracious for any manager with experience in the sector – and for specialists, in particular. "A decade ago, we were still encountering a lot of scepticism in our conversations with investors because renewable energy was largely reliant on some form of expensive out-of-market feed-in tariffs," says von Preyss. "We spent half the time in meetings discussing whether renewables technology really had a future at all.

"Those discussions don't happen anymore. Instead, investors focus on where in the value chain they should be deploying. They may be investing out of a sustainability allocation, or a general infrastructure allocation, but clearly there is far more interest in, and demand for, renewables specialists."

Ebner agrees that renewables are now viewed as a stable sub-asset class, but also points to the importance of the adjacent energy transition sector. "At the moment, those energy transition assets tend to carry a different risk profile and asset managers need to offer investors dedicated generation and transition vehicles," he explains. "But, over time, the two sectors may well merge."

Indeed, all four renewables investors are excited about the opportunities that these adjacent sectors are poised to provide. "If you are going to invest in intermittent technologies, such as wind and solar, it is impossible not to be looking at battery storage and other storage solutions as they continue to develop," says Rintala. "As those technologies become more cost-competitive, it is a natural evolution – that is where the market is headed."

Ebner points to the hydrogen space as attracting particular attention right now. "LPs are incredibly excited about the hydrogen concept, but there are very few opportunities in the market," he says. "I would assume, if you have a good and well-advanced hydrogen project, you could sell it easily."

"For wind and solar generation to continue to expand market share, investment is needed in all the related infrastructure sectors," says von Preyss. "These technologies are still in their infancy, but within the next five to 10 years they will become an integral component of the renewables ecosystem." ■

"Regulatory risk has abated. Yield assessment risk has reduced and technical risk has reduced as well. Merchant risk, on the other hand, has increased"

MICHAEL EBNER
KGAL Investment Management

KEYNOTE INTERVIEW

Powering the future



There is much more to the energy transition than renewables, with new developments emerging all the time. Ardian's Amir Sharifi, Stefano Mion and Mark Voccola look at some of the most attractive, long-term opportunities in this fast-moving space

As the urgency to mitigate and stem climate change has increased over the past few years, so energy transition investments have become ever-more compelling. Although investors may have started with plain vanilla renewables assets, the investment options have broadened significantly in recent times with the development of new technologies and storage solutions, as well as the increasing need to reposition companies dependent on fossil fuels.

Ardian Infrastructure's managing director Amir Sharifi and senior managing directors Stefano Mion and Mark Voccola discuss where they see opportunity in this rapidly expanding arena and what comes next as the decarbonisation agenda gains pace.

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Q The energy transition has a clear link with sustainability. But to what extent do investments in this area fit within ESG goals?

Amir Sharifi: Sustainability has a strong connection to long-term financial performance. We're seeing structural changes around environmental and socio-economic issues and we believe a company's sustainability is driven by business practice, culture and sense of purpose – and we apply this philosophy in our own firm as well as in our portfolio.

This comes from the top. Our founder, Dominique Senequier, is a strong promoter of sustainability and our firm was a pioneer when establishing a profit-sharing scheme for all employees in our portfolio companies. We were early signatories to the Principles for Responsible Investment, having joined in 2009, and we have measured and monitored ESG in our portfolio since 2011. As one of the co-founders of the private equity-led Initiative Climat International, established in 2015, we have also been measuring our carbon footprint for many years now.

We take sustainability very seriously because we believe it is a driver of long-term value. Our infrastructure investments produce thorough ESG reports annually and managers' variable compensation is linked to ESG measures. We encourage companies to publish their ESG reports as a way of mitigating regulatory risk and to promote ESG discussion and practice more widely. We also seek to improve practice by running workshops for portfolio companies on

areas such as biodiversity so that they can share best practice and ideas.

Q What makes the energy transition such an attractive area of investment?

AS: We are seeing a massive shift towards decarbonisation that will require significant capital. The opportunities are far broader than investment in renewable energy sources and we see the market according to three main trends.

The first is most obviously renewables and we have around 7.5GW in our portfolio today. The second is new solutions that are emerging to deal with issues such as the intermittency of wind and solar power generation. This would include investments in storage and in green hydrogen.

The third is based on the fact that the energy transition will happen. This translates into a lot of opportunity in converting assets that currently have fossil fuel exposure. We recently invested in a district heating business in Finland called Nevel, for example, which generates heat partly from peat, a process that emits high levels of carbon dioxide. We are supporting the business to move away from peat so that it will produce CO2-free energy by 2023.

There is also opportunity in deployment of new technologies, such as AI, to reduce companies' carbon footprints. Collecting and analysing data from infrastructure allows businesses to optimise their O&M on a global scale and go beyond contractual availability. Carrying out preventative O&M can really capture value in an arena where returns can be tight.

Q How might the Biden administration affect US opportunities?

Mark Voccola: The energy transition has been underway in the US for well over a decade, across multiple administrations, even if the changes haven't necessarily been categorised that way. That said, the new Biden administration will likely create tailwinds behind renewables by dint of more favourable legislation or rulemaking. We might see changes to make permit applications more efficient, or tax incentives, for example, and more federal dollars directed towards R&D and technology, all in line with the government's clear goal to support the energy transition.

"The new Biden administration will likely create tailwinds behind renewables by dint of more favourable legislation or rulemaking"

MARK VOCCOLA

Given this is a decades-long transition, it will take time before we see an evolution to the next iteration and so I expect what we'll see is a strengthening of existing investment opportunities for now. We've already seen renewables go from zero 10 years ago to now accounting for 10 percent of the energy mix.

It was a niche business just 15 years ago and now it's mainstream, with big industrial companies now having renewable products in their portfolios and utilities increasing their renewables generation capacity. The other big change is that this is now end user-driven. A few years ago, this was largely being pushed by governments; now it's being pulled by consumers. That shift makes this an unstoppable trend.

Q What role do new technologies have in the market?

Stefano Mion: New technologies are increasingly emerging that can offer solutions to weather-dependent sources of power. Digital innovation can help the grid increase the efficiency of intermittent energy supply and improve baseload capacity. And while we've seen material improvements over recent time to the basic engineering of products, such as to increase the capacity of wind turbines, the use of AI and big data have a big role to play in stabilising the grid.

These types of technology add a layer of complexity to renewable investments – you're not just buying turbines with a fixed-term PPA – but that complexity is positive for investors like us because it creates a real opportunity for management teams to create value in the assets.

Q And how do you view the role of natural gas in the energy transition?

MV: It's a great partner for renewables. The availability of cheap natural gas has enabled renewables to grow in the US over the past decade. And it will be around for decades because it will take time for renewables to gain further market share.

Natural gas can be used while technology is developed, efficiency is increased and solutions emerge to ensure interrelated sources of renewables can work together. It can also be used in areas where land or weather patterns aren't suitable for renewables currently. Overall, it's a risk mitigator that helps diversify energy sources and helps maintain the reliability of the grid.

Q Storage is clearly a much talked-about area. How do you see it developing?

SM: It's developing rapidly and improving at an astonishing speed. Yet the sector varies quite widely from geography to geography because regulators are finding different ways to integrate it according to the energy mix in each market.

Batteries are an interesting add-on to the grid, although usually we are still talking about smaller distributed solutions, such as small-scale storage for specific customers or factories. It clearly has benefits over the short term, but there is a debate about whether hydrogen might be a better solution over the longer term.

Q Could hydrogen be the long-term solution?

AS: It may well be. It's a commonly known molecule used in a variety of industries, but today it's largely produced through fossil fuel-generated sources and it is energy-intensive to produce.

However, there are two recent developments that have changed the game. The first is that the levelised cost of renewable energy has dropped below the €15 per MWh price, which makes producing green hydrogen more competitive.

The second is that governments are now starting to back hydrogen. That's essential until competition in the market reduces the capital expenditure required in hydrogen production at scale. It's a bit of a chicken-and-egg situation at the moment because you also can't make the capital expenditure unless you have scale.

We're seeing both the EU and the US strongly supporting hydrogen. There is a new EU 2030 Hydrogen Strategy and the US has recently put together a Hydrogen Program Plan. The big question is how long it will take for both to establish programmes and for demand to step up.

There have been estimates that hydrogen could account for 50 percent of energy production by 2050 and that could offer a decarbonising investment opportunity of $300 billion by as soon as 2030. We're monitoring it closely and last year we signed a memorandum of understanding with Italian utility A2A to explore the feasibility of building a green hydrogen plant. ■

Q How do you take climate change into account when analysing investment opportunities?

AS: We take into account the fact that there will be a transition and that, because many companies are reliant on fossil fuels as a source of energy today, this needs to be factored into the business plan. This has implications at the investment selection stage so that we take the risk of exposure to fossil fuels into account and make a decision about how we can future-proof the business by improving CO2 performance through strategic investment or R&D.

Géosel is a great example. It's a business that stores around 40 percent of France's national hydrocarbon consumption – it's a strategic asset for the country that allows it to cope with a crisis. With the energy transition, oil consumption will reduce and so we needed to create a long-term strategic plan for the business and create a culture centred around ESG – a move that also helps reduce the cost of financing.

We have embarked on a project called Géosel of Tomorrow in which we have asked employees for input on how we can position the business for the future. Some of the proposals include transforming salt caves into batteries, producing and storing green hydrogen, and making use of the company's existing pipelines. We want to ensure the business is fit for the future through strategy, fostering the right culture and investment.

"[Storage is] developing rapidly and improving at an astonishing speed. Yet the sector varies quite widely from geography to geography"

STEFANO MION

The new face of sustainable infrastructure

Infrastructure investors are eyeing up opportunities beyond traditional renewable energy that will help make society more sustainable in the long term, writes Stephanie Baxter

Infrastructure managers have made huge investments in renewable power sources in recent years, but the rapid acceleration of the energy transition will require them to think outside the box. Moving to a more sustainable society will completely change the way we travel, work and produce food – and all of this will require sustainable energy.

Given that the electricity market only represents around 20 percent of Europe's total energy consumption, existing renewable energy infrastructure will not be enough and new sources will have to be created. Meeting decarbonisation goals will depend on the expansion of sustainable infrastructure into areas such as hydrogen, heat pumps, cooling, e-mobility, and carbon capture and storage.

For Matt Hammond, partner at Foresight, sustainable infrastructure and real assets are about much more than just renewable energy. "The drive for enhanced sustainability has led to a significantly increased and diversified opportunity set for infrastructure investors," he says. "In energy alone, the investment goes beyond renewable energy-generating assets into batteries and other forms of energy storage, as well as transmission and distribution assets. Hybrid assets seeking private finance are increasingly common as greater efficiencies are sought across the whole energy system."

David Tilstone, head of renewables EMEA at Macquarie Infrastructure and Real Assets, says all types of infrastructure will need to become sustainable if governments' climate targets are to be met.

"We have set an ambitious target to invest and manage our portfolio in

line with net-zero emissions by 2040 – 10 years ahead of the deadline to achieve the Paris Agreement goals," he says. "This will require us to identify pathways to reduce emissions across every asset, sector and market our portfolio touches."

Beyond renewable energy, Macquarie is implementing business strategies in partnership with its portfolio companies to decarbonise heating and cooling, transport, industrial processes, agriculture and waste. Many of these sectors are in their early stages and deal activity is expected to be ramped up.

Rob Martin, director for strategy and ESG at Legal & General Investment Management Real Assets, says his team is "actively seeking" to invest in infrastructure that will facilitate the net-zero transition. He adds that the team is looking to mitigate cashflow volatility resulting from factors such as merchant revenues, technology risk and the stability of regulatory or contractual frameworks.

One of the benefits of investing in next-generation sustainable infrastructure assets is that they can help to diversify portfolios that are mostly focused on wind and solar.

"Early entry into these industries also allows investors to build relationships with the sponsors, regulators and other stakeholders, laying the groundwork for building and managing exposure as these sectors scale up," Martin explains.

What are the opportunities?

Many high-energy sectors – such as roads, rail, marine, aviation, and domestic and commercial heating and cooling systems – will need to be decarbonised. The production of steel, aluminium, cement, sugar, chemicals, plastics and agriculture will also need to be made carbon-neutral.

Peter Bachmann, managing director of sustainable infrastructure at Gresham House, believes batteries are the next frontier of infrastructure and will be increasingly used by the UK's National Grid. "The grid cannot balance itself if it is running solely or largely on intermittent renewable generation, and this is something that is starting to become somewhat well-understood," he says. "Over time, battery storage will become an even greater asset class."

> *"Hybrid assets seeking private finance are increasingly common as greater efficiencies are sought across the whole energy system"*
>
> **MATT HAMMOND**
> **Foresight**

Bachmann notes that, during the early stages of the pandemic, the National Grid was looking at how much it would cost to balance the grid by keeping old gas-fired power stations running. "This was at a time when it should have been quite cheap, in that everyone was home during covid-19, and it was quite sunny and windy so there was not much imbalance," he says. "But they worked out that the cost to balance the grid [in this way] would have been a fraction of the price if they used batteries to supply balancing services when needed."

Bachmann adds that, depending on which way the National Grid goes to try to manage this imbalance, other forms of storage might become attractive, such as pump storage and other technologies to provide long-duration balancing.

Another big area of opportunity is decarbonisation of the heat sector, which is estimated to cost around £1 trillion ($1.37 trillion; €1.15 trillion) for the entire UK market.

"The UK government has not really tackled the heat side of things," says Bachmann. "A lot of other countries in Europe have district heating networks so that they can use energy-efficient centralised equipment."

Gresham House is looking at opportunities in heat pumps, an area the UK government's recent budget alluded to. There was a £5,000 voucher incentive scheme for air-source heat pumps, which the government has now withdrawn.

"Hopefully, the government will announce some other new mechanisms to try to encourage air-source heat pumps," Bachmann says. "We think that they could be a really great way of taking people off oil, and there are a lot of people in the UK that still use oil burners or use oil as their primary source of heat, which is incredibly environmentally unfriendly. So, there is an opportunity to transition those people."

LGIM Real Assets recently provided debt finance to HeatRHIght, a renewables funding scheme that supports the delivery of air-source heat pump technology to social housing.

"This is an example of a transaction where the key risks in new generation infrastructure were appropriately addressed in the financial structure," Martin says. "In addition to clear decarbonisation benefits, that investment structure featured among others a technology with a proven track record, manufacturer guarantees and revenue stability of the underlying assets."

Sustainable transport, which has typically focused on electric vehicle charging infrastructure, is another area from which opportunities are likely to arise. Hammond says Foresight has invested in biomethane refuelling to enable truck owners to move away from diesel and that, in the longer term, all transport will either be electrified or, in some applications, move to clean hydrogen.

He adds that opportunities in district heating and other forms of heating and cooling infrastructure are also

emerging, as accepted practices in sustainability vary across the world.

Hammond says digital infrastructure is another "obvious area" with sustainability credentials that is enabling people's lives to be more connected and resilient in the face of whatever challenges come next. It can have benefits such as reducing travel and urbanisation pressures, as has been evidenced during the pandemic.

The next frontier is sustainable agriculture, which is a big challenge and an opportunity that will last a long time, according to Hammond: "Whether it is building greenhouses or more sophisticated controlled environments for salads or fish, acquiring nutritionally exhausted fields and allowing them to recover and become profitable organic farms, or to protect and enhance existing forestry or to develop new forests in depleted agricultural lands, it all requires long-term patient capital."

Gresham House is investing in other sustainable businesses, such as those involved in vertical farming or the production of alternative proteins, which can replace high consumption of environmentally unfriendly soy in the seafood industry.

US wind opportunities

Although renewable energy is well established in Europe and infrastructure asset managers have invested heavily in this area, there may still be opportunities in other countries or regions. For example, the US has lagged behind Europe in offshore wind.

Macquarie's Tilstone believes offshore wind will have an important role to play in decarbonising the US power sector, which will create further opportunities for infrastructure investors. "We are actively looking to leverage our experience from the European market in the US," he says.

Foresight's Hammond agrees that offshore wind will play a part in the US's move to decarbonise: "Like everywhere, as the industry scales – and as the size of the turbines grows – other peripheral opportunities [will] emerge in, for example, port infrastructure, maritime service vessels."

However, Alistair Perkins, head of infrastructure debt and project finance at NN Investment Partners, thinks onshore projects will continue to represent the majority of the renewable energy market in North America, with offshore wind playing a smaller role in specific locations. This is because Europe had limited land available for large-scale onshore wind farms, but the market drivers in North America are quite different, with "significantly less pressure" on land availability for large-scale wind and solar projects onshore.

"In addition, grid inter-connectivity is quite extensive across continental Europe," Perkins adds. "The North American market has significant capacity constraints with limited interconnectors between Texas [ERCOT], western [WECC] and central/eastern power grids."

What are the challenges?

Darryl Murphy, managing director for infrastructure at Aviva Investors Real Assets, believes the opportunity set is very much about the low-carbon energy transition plus digital because government policy will want private capital to focus on these areas.

However, he points out that today it is difficult to find those opportunities.

> *"The grid cannot balance itself if it is running solely or largely on intermittent renewable generation"*
>
> **PETER BACHMANN**
> **Gresham House**

"There is probably a lot of capital struggling to find the opportunities immediately," he says. "Some of these markets are a little bit more nascent but will develop over the next few years, so that should be good in some respects. It just comes down to how quickly some of these new technologies will become commercially deliverable."

Another challenge is the lack of a robust regulatory model in nascent sectors. Tilstone notes that the regulatory environment may not be well developed at an early stage, which can create challenges around the stability of these assets as an investment opportunity.

"Often they need some form of partnership between governments and the private sector to create an initial framework that helps ensure stability for investors," he says. "As the market evolves, costs can be reduced and stabilised, and business models can ultimately stand independently in the long term. The development of the renewable energy sector is a good example of this."

Martin of LGIM Real Assets says that in the early days of renewable energy, a robust regulatory framework was put in place to provide long-term revenue visibility and stabilisation, and that this led to the rapid scaling up of the industry and rapid capacity deployment.

"A similar regulatory framework is needed now to speed up the deployment of the next generation of sustainable infrastructure," he says. "Support from the new [UK] Infrastructure Bank in the form of guarantees and credit enhancements could prove crucial in this early stage of deployment."

Despite the challenges, Perkins believes the market trend for the definition of infrastructure to be expanded will continue during 2021. He predicts this will be against a backdrop of investors seeking higher returns in the low-interest-rate environment, increased competition for a finite pipeline of assets and greater scrutiny over ESG performance. ■

KEYNOTE INTERVIEW

Anticipating energy's evolution

To be successful in the fast-moving world of the energy transition, asset managers must have deep industrial, sector and geographical expertise, says global head of infrastructure and structured finance at Edmond de Rothschild, Jean-Francis Dusch

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Q Where are the most interesting energy transition opportunities from an infrastructure debt perspective?

The opportunities are everywhere. It is a global play. The energy transition is a global phenomenon and the technologies to support that transition are proliferating at a remarkable rate. The real question, for me, is whether an asset manager can capture those opportunities. We believe we are thanks to our deep industrial knowledge.

To do so, you need to understand the changing regulatory environment in each country, and you need to understand the industrial and technological evolutions that are taking place. That means understanding newer technologies, such as floating offshore wind, hydrogen and battery storage, for example. It is also about assessing accurately if evolutions within existing technologies, such as the increasing size of blades for onshore windfarms, still make them reliable assets that are easy to operate and maintain, as we wish to keep the risk profile acceptable to our investors.

When I talk about understanding, I don't mean the ability to adapt to changes once they have taken place, but rather to anticipate those changes before they happen. Of course, we also need to be able to structure the debt instruments, but that's table stakes. What really sets an asset manager apart is the industrial and technological knowledge of its team, as well as in-depth knowledge of both individual markets and regulatory frameworks and strong relationships with the public sector.

Different regions have different sets of rules and behaviours. So, you need to have relationships with the decision-makers behind tendering projects and the implementation of regulatory frameworks. The greater the breadth of that experience, the more able you are to take advantage of the energy transition opportunity set, because it is vast and it is global.

Q If the ability to look ahead is important, what do you see as the next wave of investment propositions?

Take something like floating offshore wind. We have been looking carefully at that sector for the past three years, and it is now starting to become 'investable'.

The same is true of battery storage. There have been a handful of transactions so far, but more are coming.

Hydrogen is clearly another very hot topic, and we are starting to see transactions that can make sense for our investors as well. Meanwhile, we ourselves carried out one of the very first project financings of an EV charging asset linked to the Trans European Transport Network – Green Mobility – around 18 months ago.

Inevitably, the approach has to be different when compared with lending to highly evolved sectors where you have done many similar deals in the past. It is almost like going back 25 years to when the first mobile networks were being rolled out and project financing needed to be raised.

Nobody could really predict mobile penetration and so assumptions had to be conservative when defining quantum of debt and the appropriate security package. These are new and partly unproven business plans and, again, that is where depth of experience comes in to mitigate the risk and bring the risk profile to what our investors wish us to invest in.

Q How competitive is the lending landscape for these types of asset?

It varies significantly from country to country and from regulatory regime to regulatory regime. You have to approach value assessment and risk mitigation differently, depending on where you are looking. It is tailor-made and experienced asset managers will appreciate and embrace this challenge.

Indeed, sometimes the situation differs from region to region, even within a single market. So you need to have local experience, but you also need to have an understanding of global trends, in order not to misjudge an investment.

For example, the first merchant deals we participated in took place 20 or 25 years ago. They were not necessarily a success, but they taught us a great deal. We are able to look back at those transactions in relation to current pricing projections, which proved key in our risk assessment and acceptance as well as in sizing of the debt and the level of cushion we want to embed in the structure.

Pumped up: hydrogen is among a raft of assets becoming increasingly attractive

However, pricing isn't everything and analysing an asset is about making sense of a complex, comprehensive set of components; pricing is just one.

> *"You have to have the skills and experience to be able to take a view on what the operational challenges of an asset will be, beginning with its remaining life"*

Q What are the biggest challenges you would associate with deploying capital in these sectors?

The biggest challenge but also opportunity is probably the speed of technological evolution that is now taking place and the need to assess the associated risk.

Equally, the regulatory environment has evolved, sometimes rapidly. You have to consider the policy backdrop and the history of how a given jurisdiction has behaved. Then you need to look at the revenue drivers.

Are you dealing with a feed-in tariff. Is it corporate PPA? Is there an element of merchant risk? Is that merchant risk full or partial? We also have to consider if that framework is likely to remain in place or if a country may decide to transition to a more merchant environment, perhaps for budgetary reasons.

Operational considerations are crucial too. You have to have the skills and experience to be able take a view on what the operational challenges of an asset will be, beginning with its

remaining life. There are many moving parts to be taken into account which differ from country to country and sub-sector to sub-sector. And these considerations can pull in opposite directions, so it is all about weighing up individual opportunities on a case-by-case basis and structuring the underlying debt instrument on a tailor-made basis.

Q Has covid impacted interest in the energy transition agenda?

I think the pandemic has created more awareness. It has highlighted the importance of protecting the planet and of caring about society. It was interesting that in the early days of lockdown, pollution levels declined rapidly and air quality improved, which just served to remind everyone that it is possible and necessary to live in a cleaner world.

At the same time, however, I think that train had already left the station and was travelling at high speed. Certainly, the transactions that we are working on would have taken place anyway.

Q Do you think government reactions to the pandemic will have a meaningful impact on dealflow?

I do think that governments will deliver. We advised quite a number of them and have good insight into their plans. There is a firm commitment to 2050 targets around global warming and CO2 emissions and we know that infrastructure investment is an important way to boost economic growth when the economy has suffered.

That should help accelerate the implementation of some of these programmes that have been announced. But, at the same time, we are not waiting for governments to turn stimulus plans into action. Our job is to invest on behalf of our LPs and we cannot afford to wait for government initiatives to translate into investable propositions.

Q From an LP perspective, what is the advantage of accessing the energy transition through debt, rather than equity?

The appetite for infrastructure debt is certainly growing, which is a positive. Although the majority of the financing comes from debt, historical LP appetite and fundraising has been focused initially on equity. There are two distinct strategies within infrastructure debt. There is the senior play, at perhaps a 250bps spread, involving investment-grade assets and Solvency II eligibility, which is certainly very attractive for insurance companies. It is a liability-matching exercise, which is also generating attractive yield when compared with listed corporate or even sovereign bonds, right now.

There are also the higher-yield, or yield-plus, strategies, involving junior debt or perhaps riskier senior debt, generating a 5-6 percent spread. Here the appeal for LPs is a high-yielding investment with the added benefit of that element of security: fixed income and predictable cashflow.

As the world of equity becomes increasingly competitive, with more and more capital being raised, returns in many areas are sometimes being squeezed into the mid-single digits, and so a yield-plus debt exposure is becoming increasingly attractive. We were one of the first to introduce a separate yield-plus strategy to also avoid conflict of interest and offer investors the benefits of both strategies across separate portfolios. We seem to have identified a strong demand here.

"What really sets an asset manager apart is the industrial and technological knowledge of its team, as well as in-depth knowledge of individual markets and regulatory frameworks"

Q How else will energy transition evolve?

I believe one reason that people like myself and my team, and our peers in the market, are involved in this sector is that we have a conviction that we need to protect our planet and contribute to sustainable development. We care about the planet and about society. ESG means something to us and is a clear commitment of the Edmond de Rothschild Group. It is exciting and a blessing to be a part of the energy transition.

It is clear that government commitment to the transition is now also strong. It has become a global phenomenon. And the speed of tech evolution is remarkable.

To be honest, for me, it's really about whether LP liquidity can keep pace with the sheer scale of investment opportunities. And, of course, for us as asset managers, to convince those LPs that we are the right people to make that happen. This is a critically important challenge that the world is grappling with and I am truly excited to have a role to play. ■

Sizing the hydrogen infrastructure investment opportunity

Hydrogen will play a key role in the energy transition, but lower costs and government support are needed for it to become a major opportunity, writes Stephanie Baxter

Hydrogen has quickly transformed from a niche prospect into a global opportunity as many and varied countries commit to reaching net-zero greenhouse gas emissions by 2050 or earlier. The universe's most commonly found element is expected to play a crucial role in the climate-neutral economies of the future – as shown in many recent scenarios and roadmaps – because renewable energy will not be enough to meet ambitious net-zero and decarbonisation targets.

Last year, many countries introduced hydrogen strategies. Europe has recognised hydrogen as essential to supporting its commitment to reach net-zero by 2050 and has set clear targets to increase electrolysis capacity. In July 2020, the European Commission released its Hydrogen Strategy as part of its European Green Deal to tackle climate change.

A big opportunity?

Expansion into hydrogen and carbon capture and storage will be required to decarbonise energy intensive sectors such as transportation, heating and high energy industries like steel and chemicals. In combination with renewable electricity, it has the potential to entirely replace hydrocarbons in the long run.

Dan Watson, head of sustainability at Amber Infrastructure Group, says hydrogen is a "great solution" for at-scale electricity storage to smooth peaks in energy demand – and so ensuring that power resources are available even when the wind is not blowing, or the sun is not shining. Furthermore, hydrogen can be seasonally stored and transported cost-effectively over long distances by ship or pipeline.

Martin Bradley, senior managing director of Macquarie Infrastructure and Real Assets, is optimistic about the role the element will play in the race to net-zero targets. He believes the hydrogen landscape has "evolved significantly" and has been underpinned by a global shift of regulators, investors and consumers towards decarbonisation.

> *"It has proven exceedingly important that any support scheme provides long-term visibility and stability"*
>
> **MARTIN BRADLEY**
> **Macquarie Infrastructure and Real Assets**

"This momentum exists along the entire value chain and is accelerating cost reductions for hydrogen production, transmission, distribution, retail and end applications," he says. "We are energised by the strong sense of momentum and believe it is critical to act now if we are to achieve the various net-zero targets that have been set."

While Macquarie does not believe hydrogen is the only low or no-carbon solution, the manager sees it as a key piece of the decarbonisation puzzle. "Importantly, low-carbon hydrogen will also help to meet our increasing energy demands with supply," Bradley says.

For Amber's Watson, while there are many potential applications, the hydrogen opportunity should focus on hard to abate sectors. He believes there are "real opportunities" to decarbonise domestic heat, heavy transport and heavy industry. While hydrogen does not directly result in a reduction of energy use, it can provide climate-friendly solutions to meet energy demands that are otherwise difficult to supply.

For example, hydrogen energy can be economically stored for longer

intervals than current battery technologies, while distributing an equivalent quantity of hydrogen energy through a pipeline is considerably cheaper than transporting through electricity wires, says Bradley.

There are many other uses, he adds: "Hydrogen has an existing and further potential role in many industrial processes, such as chemicals and steel production, where electrification is difficult. And for long-haul transportation, including ocean shipping and aviation, hydrogen is a sustainable option where electric battery technologies are not adequate."

Finally, as hydrogen is a tradable commodity, it can be shipped to regions with insufficient renewable energy potential to help them reach their net-zero targets.

Variances among countries

While hydrogen is expected to play a big role in achieving net-zero carbon emissions globally by 2050, there will inevitably be variances across countries. As Watson says, the opportunities "will differ between countries and regions", which will depend on "several factors such as resources available, existing infrastructure and skills of respective workforces".

Bradley thinks that large gas consuming countries, including Germany, the UK, France and Italy, are likely to lead with investment in low-carbon hydrogen, and that the Netherlands is also an important transit country. Furthermore, he says North Sea economies and the "olive belt" have advantages on energy costs and are also likely to be early adopters of low-carbon hydrogen.

"We believe Europe has what it takes to be a real leader. However, it's critical that there are coherent strategies and support mechanisms. It has proven exceedingly important that any support scheme provides long-term visibility and stability. Unexpected alterations or retroactive changes tend to harm the progress of emerging sectors," Bradley says.

Gas pipelines

If hydrogen is used to decarbonise the gas grid, it could reuse the existing infrastructure rather than having to build it from scratch, which would be very costly. Bradley believes existing gas pipelines could be used for transporting hydrogen as a lot of the infrastructure is already there.

"We have functioning gas networks that can be used to enable a low or no-carbon hydrogen future," he explains. "Today, heating for domestic properties and industry accounts for half of the UK's energy consumption and one third of its carbon emissions (83 percent of homes use gas to keep warm). There is an obvious opportunity to blend hydrogen into the current natural gas network."

Macquarie is working with gas distribution companies within its portfolio to explore the viability of hydrogen through pilot projects, including blending and developing carbon capture storage infrastructure to carry hydrogen to industrial areas.

"These pilot projects are relatively small and early stage, but they are a unique platform to build first-hand experience, relationships and be a relevant voice in the policy-making context," says Bradley.

Cadent, which runs the UK's biggest gas distribution network, is leading the way on this with its hydrogen pilot, HyDeploy, which is a pioneering hydrogen energy project designed to help reduce UK CO2 emissions and reach the UK government's net-zero target for 2050. It includes the development of a hydrogen pipeline and the creation of the UK's first carbon capture and storage infrastructure. CCS is an important technology to achieve the widespread emissions savings needed to meet the 2050 carbon reduction targets.

Watson says this pilot, blending hydrogen with natural gas, is very innovative: "As the first live demonstration of hydrogen in homes, HyDeploy aims to prove that blending up to 20 percent volume of hydrogen with natural gas is

"A number of projects are being developed at scale, but I think the biggest issue right now is the economics today don't make sense"

JASPAL PHULL
Redington

Fuel of the future? Hydrogen can be a key piece of the decarbonisation puzzle

a safe and greener alternative to the gas we use now," he says.

Crucially, it is providing evidence that customers will not have to change their cooking or heating appliances to take the blend, which means less disruption and cost for them.

"It is also confirming initial findings that customers don't notice any difference when using the hydrogen blend," says Watson. "If that is the case, it will create a significant market for hydrogen production and help scale the UK's hydrogen ambition."

Government support is needed

The investment needed to support the expansion of the low-carbon hydrogen economy is considerable, but it also comes with a high degree of uncertainty around regulation, market design, demand and supply, and revenue support.

Hydrogen's role in the energy transition will largely depend on its costs coming down. Today, it is still double or triple the cost of energy equivalents such as gasoline or diesel, but new technologies are usually expensive initially to compete with current sources – as was the case for solar and wind power versus coal.

Redington's senior vice-president for real assets manager research, Jaspal Phull, says that while hydrogen will play an important role in decarbonising global energy systems, it is currently challenging.

"What will make it difficult is that looking at the time horizon and economics of hydrogen, the conversion agenda is quite challenging. A number of projects are being developed at scale, but I think the biggest issue right now is the economics today don't make sense," says Phull.

"Looking back 10-15 years ago, the economics of wind and solar did not make sense and we are where we are right now because of the carbon subsidies and the cost curve has come down."

With hydrogen, there will need to be a big change in the cost curve just like for wind and solar, says Clearbridge Investments director and portfolio manager David Pow.

"For demand to ramp up, and also for utilisation to ramp up, would require the costs [of hydrogen] to come down. That would be more like back-end loaded growth rather than very linear across the next three decades," he says.

The current cost of green hydrogen – in US dollar per kilogramme terms – is somewhere around $4.

"For it to have more parity with blue and grey hydrogen, it would need to come down to $1-2, which is what Europe has forecast by 2030," says Pow. "Some more bullish forecasts even say that potentially by 2025 we will reach cost parity of green hydrogen versus blue and grey hydrogen."

Costs can be brought down through supportive government policy and regulatory frameworks, to enable faster adoption by the private sector.

"The need for hydrogen policy support is similar to the renewables industry in the early 2000s, or the electric vehicle industry in the 2010s, and now the energy storage market," says Bradley. "The good news is that we know these measures work and we can see how they can support low-carbon hydrogen in becoming mainstream."

Hydrogen will clearly play an important role in the global move to net-zero, but there are still many cogs needed to be turned for the hydrogen economy to really take off. The greatest challenge is to avoid setting the industry on a slow ramp-up trajectory, which in turn could be detrimental to the success of the hydrogen economy, says Bradley.

"Government support schemes must be progressed swiftly to grow demand for the low-carbon hydrogen economy and build investor confidence in its value chain." ■

KEYNOTE INTERVIEW

Exciting energy transition assets mean thinking small

Energy transition assets such as batteries, EV charging and green hydrogen are often only available in small packages, which requires managers able to build platforms from smaller assets, explains Barbara Weber, founding partner of B Capital Partners

Q How does the energy transition fit into the trends shaping infrastructure?

We see three major trends shaping infrastructure investment today – climate change, technological advancement and urbanisation. All these trends are interconnected and all require sustainable infrastructure. For example, the need to tackle greenhouse gas emissions and move to zero-carbon societies requires technologically advanced solutions – such as battery storage, which can enable growing cities to regulate volatile power demand and supply, or green energy generation for the purposes of, for instance, charging electric vehicles.

These mega-trends feed into more specific themes in the energy transition. A December 2020 report from the consultant Rystad Energy highlights three key areas: carbon capture and storage, green hydrogen and battery storage. Like the identified mega-trends, these themes are highly interconnected. Rystad Energy elaborates how batteries compete with hydrogen, and both compete with carbon capture. The reality is that there won't be one winner, as all these sectors will have an important role to play in helping us get to net-zero. All sub-sectors are somehow connected by digital infrastructure, which is an essential part of the energy transition and the development of smart cities. At the end of the day, new infrastructure is decentralising and we have to connect the dots with data.

Energy networks, smart lighting, smart meters and autonomous vehicles on the road all need data connections to communicate where they are and what their status is. Even for our windfarms, we receive status information every second, connected via data networks. When you build decentralised systems, data infrastructure is essential.

Q Why focus on the energy transition?

We are committed to invest exclusively in sustainable infrastructure in the energy transition space. As such, we focus on assets such as battery storage, waste to green hydrogen, district heating and EV charging while still considering hydro, wind and solar.

Our approach is to invest in smaller assets in these sub-sectors. This is where the most exciting advances are happening and where one can generate true alpha. They are not happening in the big established and institutionalised parts of the market; like the first wave of renewables, they are happening on the ground.

In this area of the market, you need a fund with the flexibility to write small tickets to be able to go small. That way you can get early access to those ground-breaking assets that will be important to the energy transition and that can be built into platforms.

Large fund managers and institutional investors are not able to go that small, both because of the time and effort needed to understand these new assets and because of the relatively small tickets.

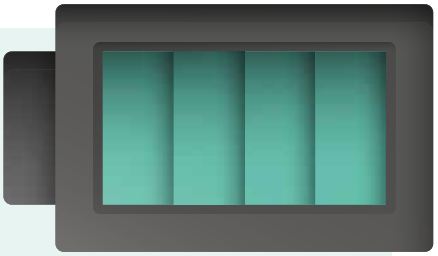
For example, the biggest single battery in Germany at this point is still only 50MW, and a 50-60MW battery costs €40 million-€50 million at best – which represents, after appropriate leverage, a small equity investment for a large manager or institutional investor.

We have spent time to penetrate the market, to identify suitable sustainable assets and to invest into small-scale plants. Once we have built the platform and it works, large investors will be interested in buying into it.

Q What are the benefits of investing in smaller-cap assets?

In small- and mid-cap infrastructure, there is a good supply of new projects and at the same time relatively little demand, which means that the economics tend to be better than for large assets

Plugging into the battery opportunity



Q How do you apply your investment strategy to battery storage?

This is a typical sub-sector of the energy transition where you cannot buy large assets in Europe, as of yet. There are growing numbers of industrial players developing smaller-scale assets in countries such as Germany. We accumulate these assets, which are scalable, into a platform that will generate attractive long-term yields and attract large fund managers or institutional investors.

Q What's the attraction of battery storage in Germany in particular?

Within Europe, Germany is a large, stable and predictable market. It offers revenue streams and incentives set by the regulator that are not available in other markets, such as the UK. Nevertheless, it is relatively new to financial investors.

Because battery storage is a decentralised market with relatively small assets, many fund managers find it hard to enter. Some do not speak the language or, if they do speak the language, they are simply too far away from where the action is. Being based in Switzerland and with Germans on the team, we have access and build relationships with developers to ensure we get to secure these assets early.

Q What role do batteries play in the move to net-zero?

The sustainability aspect of batteries is very important and more significant than most people seem to know. German coal power plants are still generating over a quarter of total electricity in Germany and are also used for the primary reserve when a demand peak pops up. They run all year round with a massive negative sustainability impact.

Even after subtracting the energy the battery uses itself and the energy and resources needed to produce the battery, you can replace thermal power plants in their primary reserve functions and save a huge amount of carbon emissions within the battery's lifetime of 15-20 years. In addition, batteries can also store green energy at times of low demand, which otherwise would have been lost.

The bottom line is that the emissions from batteries are a drop in the ocean when compared with those from a thermal power plant.

where we see relatively little supply and a lot of demand. Large infrastructure investment managers are often competing with each other, as well as with institutional investors, for the same large-scale infrastructure, which drives up prices and reduces returns.

Equally important, you find a much broader universe of potential investments in small-cap infrastructure simply because certain assets are as of yet only available in small sizes. This gives us better potential for diversification across sub-sectors.

We don't mind getting our hands dirty on small stuff – sometimes you can build something very interesting out of it.

Q How do you source these assets?

We source almost exclusively from industrial players. To this end, we actively look for developers and industrial partners in sectors and geographies that are of interest.

In several target countries, we have mapped all infrastructure assets that exist to our knowledge. We have done that for example for Germany, Norway and Austria. This way we find operational assets we like and we find out who owns them.

We also develop networks with local and national utilities that enable us to follow the trail from the assets to those developers that are creating new infrastructure. In addition, we get plenty of unsolicited offers because we have a track record in these sectors. Most importantly though, it is about having a proactive approach of reaching out, rather than expecting sellers to find you.

The relatively limited competition in these segments increases the chances of securing an asset or even a pipeline of assets. Many of these smaller players do not have an investor network to properly run an auction process. This gives us an opportunity to build a relationship of trust while getting to know the asset. Also, developers and smaller corporates tend to prefer long-term relationships with repeat deals since it reduces their transaction costs dramatically.

Q Does new small- and mid-cap infrastructure carry higher risks?

The short answer is no. We do not take the technology risk or development risk often associated with smaller assets. While we do get in contact with industrials when their assets still have development risk – or even technology risk due to unproven technology – at that stage, we follow them, keep a dialogue and guide them, so they understand the milestones they need to reach by the time we invest.

The skill is to see which assets lend themselves to being de-risked before or when we enter, so that we are sufficiently late but also sufficiently early. In sub-sectors where there is not much competition, you can have a proper conversation with the seller about risk and mitigating structures, including earnouts that de-risk the investment for us. In the hydrogen space, for example, there is such a hype suddenly that some investors are ready to take that development risk. That is not something we are prepared to do.

"In this area of the market, you need a fund with the flexibility to write small tickets to be able to go small"

Certain types of risk cannot be structured, such as country risk (unless you take out political risk insurance). So, we focus on AA- and AAA-rated countries with regulators that are reasonably predictable.

The bottom line is that we generate very attractive risk-adjusted returns. Our infrastructure assets typically have a core/core-plus risk profile while generating returns that beat what investors that follow the large players might usually expect.

Q You mentioned the need to connect the dots between infrastructure themes. How are you doing that?

Energy transition is a broad theme covering a lot of sub-sectors, meaning you can create natural diversification across your portfolio. Beyond that, you can acquire assets that mutually support each other. If you have a wind farm, you can use it to produce power for another asset that also contributes to the energy transition – for example, to feed a green EV charging network, or to produce green hydrogen that can then be used for green hydrogen buses.

As an investor in various of these assets, you can structure, for example, PPAs between them, creating stability and a good business case for each. We also partner with industrials to profit from value chain-integrated solutions such as utilities' competence in trading electricity or building infrastructure.

This is an innovative approach, with few funds focusing on the energy transition sub-sectors in this way: diversified, de-risked and connected.

Investors we talk to are very interested because they see it is a relatively unbeaten path for now, which means there is the potential for outperformance and sustainability. ■

China's $6.4trn energy transition commitment

With a net-zero target for 2060 and as one of the world's worst polluters, China will have to facilitate significant investment in its infrastructure. Jon Yarker investigates whether this a theme international investors can buy into

Although it may be one of the world's largest economies, China has a reputation for being one of the worst polluters. However, President Xi Jinping stunned the international community in late 2020 by announcing a sea change in the country's energy policy. Speaking to the UN, he revealed China would be targeting a peak in its carbon emissions before 2030 before achieving net-zero status by 2060.

The scale of this task is immense and energy research consultancy Wood Mackenzie estimates it will require $6.4 trillion of investment to bring about. Prakash Sharma, the firm's Asia-Pacific head of markets and transitions, says: "It is definitely a colossal task for a country using 90 percent hydrocarbons in its energy mix and annually producing more than 10 billion tonnes of CO2 [equivalent] and, in addition, accounting for 28 percent of global total emissions."

The opportunities for infrastructure investment are clear. Yet questions will linger as China's energy transition theme may not be one to which all infrastructure investors will be willing to commit. For a long time, many Western investors have treated Chinese investments with scepticism due to concerns over lack of transparency and the unavoidable influence of the ruling Communist Party.

Gaining trust

Flora Wang, director of sustainable investing at Fidelity International, has analysed China's plans from a policy perspective. Although the country faces significant challenges, she expects it to follow through on its clean energy commitments simply because it has to.

> *"As markets like the EU start to consider the introduction of a carbon border tax, it is important for China to cut its carbon emissions to remain trade competitive"*
>
> **FLORA WANG**
> **Fidelity International**

"From an energy security perspective, China needs a lot more renewable energy because it is heavily reliant on oil and gas imports," says Wang. "As the world's factory for the past 30 years, China has also been the biggest exporter of carbon. Much of the carbon generated in China is embedded in the products that are exported and consumed elsewhere. As markets like the EU start to consider the introduction of a carbon border tax, it is important for China to cut its carbon emissions to remain trade-competitive."

The case for President Xi staying true to his word is clear, and the benefits for China stretch beyond simply fighting climate change. As a superpower that wants to strengthen its international position, embracing the next generation of energy production makes sense and many commentators acknowledge China has the economic heft to push through such a large-scale change.

Zula Luvsandorj, a project finance advisor to the UK Cabinet Office, says investors should view the heavy involvement by the state as evidence that China is sincere about achieving its energy transition goals.

"Larger corporations, including state-owned enterprises, are well

matured internationally and transparent enough with international investors, especially listed larger private infrastructure companies," she says. "There have been strong success stories of EU and developed-market larger players going into business in China, such as EDF's collaboration with Chinese investors on offshore wind investments.

"Personally, it is a pleasant journey to deal with larger SOEs and they are trustworthy as business partners."

China's SOEs have already played a pivotal role in the country's urbanisation drive and are partly why the country's development has become synonymous with 'ghost cities' – vast urban landscapes created in anticipation of growing populations. This is the result of a campaign by China's Ministry of Housing and Urban-Rural Development to fully integrate 70 percent of its population – around 900 million people – into city living by 2025. As of last year, China had reached 60 percent of this target, helped in part by significant state-led investment in urban living spaces.

"China is very good at the construction of larger and innovative technology projects nowadays and they are seeking the right collaboration with EU counterparties," says Luvsandorj. "There is great potential in the offshore wind area, where EU investors can collaborate on a win-win basis, filling the gaps in each other's skills."

Clearing the smog

For China to achieve its net-zero ambitions, it will require a vastly different energy infrastructure set-up. Consultancy Intralink has calculated that, based on renewable energy accounting for 9.5 percent of China's electricity, this could require $1 trillion of investment in new energy infrastructure alone.

Solar power has been identified by many commentators as a natural route forward for China's energy infrastructure transition. This is partly because, despite the country's infamous citywide smog clouds, China actually produces more solar power than any other nation. According to the International Renewable Energy Agency, China is the top ranked country for energy produced by solar power and in 2020 produced 254,000MW of electricity this way. The second-highest ranked country was the US, which produced only 75,000MW.

> *"Electric vehicles and other new energy vehicles are the future of mobility in China and will require massive investment in charging infrastructure, hydrogen generation and distribution"*
>
> **MICAH HOSTETTER**
> **Intralink**

"The share of solar energy in China's power generation mix increased by 16.6 percent in 2020 compared to previous years and the 14th five-year plan envisages that this should continue to increase," says Ying Fu, an energy and infrastructure lawyer at Linklaters. "However, in parallel, the Chinese government is also looking to phase out subsidies for solar and further encourage competitive bidding as the cost of solar power generation continues to fall.

"That said, while official reports emphasise the general phasing-out of national-level government subsidies in the coming few years, there will remain an expectation for local governments to continue to support projects in their locality on a case-by-case basis. Investors will need to take these regulatory developments into account when looking at investments into solar in China."

China dominates the solar world and, despite the notion of government subsidies being pulled back, these projects could still benefit from state support via the involvement of SOEs. As a result, Luvsandorj is optimistic about this trend.

"Larger Chinese corporations, especially SOEs, have been frontrunners in solar technologies and now almost 80 percent of solar technologies worldwide are manufactured in China," she says. "There are large projects in China, which Chinese SOEs are hugely benefiting from due to their status and the incentivised nature of these schemes."

Driving change

The infrastructure investment opportunities aligned with China's energy transition go beyond new power plants and cleaner energy sources. China has already been identified as the biggest electric vehicle market in the world and, as a country with roughly 372 million fossil-fuel-powered vehicles – the highest number in the world – this will require an overhaul of infrastructure.

This has already begun. Intralink energy specialist Micah Hostetter points out that 800,000 charging outlets have been built in China over the past year, and highlights the potential for new energy sources, such as hydrogen, to be increasingly adopted in this market.

"Electric vehicles and other new energy vehicles are the future of mobility in China and will require massive investment in charging infrastructure, hydrogen generation and distribution," he says. "[One of hydrogen's] most important uses is arguably not in the passenger vehicle space – in which it faces stiff competition from batteries – but in public transport, trucking and other heavy-duty applications."

Logistical challenges remain in terms of transporting and distributing hydrogen gas, but this has not stopped China

Sino things to come: China is a global leader in solar power, but is also turning to wind, hydrogen and nuclear

proceeding with heavy investment in hydrogen-friendly infrastructure. "As of 2020, the country only had about 50 refueling stations nationwide," says Hostetter. "That said, tens of billions of dollars are being ploughed into the industry and I'm optimistic China will be one of the first countries in the world to successfully build a hydrogen economy."

Investment in new infrastructure for China's electric vehicle market is already gathering momentum with some of the country's largest utility companies confirming plans to invest in this. China Southern Power Grid has already committed to investing $3.6 billion in new charging infrastructure over the next four years. Such efforts are projected to make China the second-largest market for charging infrastructure, next to the combined European market.

China's energy transition may have been announced with the rhetoric of saving the environment, but the ensuing infrastructure investment opportunity is not limited to renewables. The country is also pivoting heavily towards nuclear energy.

"Both nuclear and renewables have made tremendous strides in the past decade in China," says Hostetter. "Nuclear capacity has increased from 12GW in 2011 to 51GW in 2020 and currently accounts for 5 percent of China's electricity generation, producing 366TWh last year."

Fission expedition

Undoubtedly cleaner than fossil fuels, nuclear energy still attracts critics due to the waste it creates and the safety concerns following the disasters in Fukushima and Chernobyl. What cannot be denied, however, is the infrastructure investment that long-lasting nuclear power sites require.

"China is one of the few major economies pouring money into nuclear deployment and next-generation reactor technology," adds Hostetter. "I've seen some estimates predicting that nuclear will supply 20 percent of China's electricity by 2050 with deployed capacity of 340GW – an almost sevenfold increase from today."

It is clear that China has set itself targets that would be ambitious for any country, let alone one with an existing energy infrastructure set-up so dependent on fossil fuels. It remains to be seen how China will manage to meet its own targets, and many Western investors will still be wary about engaging with the country's energy transition story.

However, as Wang points out, China has met renewable targets before and this could give an idea of how the country will embrace its infrastructure obligations: "China had a 2020 target of cutting carbon intensity by 45 percent from the 2005 level, which it actually achieved two years ago.

"Another 2020 target was to hike its non-fossil fuel share of the primary energy mix to over 15 percent, and that was achieved last year. I think the good track record gives us some level of assurance that China can achieve its 2060 pledge." ■

KEYNOTE INTERVIEW

Electrifying developments

Electrification is at the heart of the energy transition and the international drive to net-zero greenhouse gas emissions, explains Julien Touati, partner and corporate development director at Meridiam

Q What issues are driving the energy transition today?

One is technology and the role of renewables in our energy mix. That's really the backbone of the shift in terms of emissions in the energy sector. The other major consideration is to think about the social consequences that flow from the energy transition. For example, when you electrify mobility, what is the impact? How do you help heavy industries transition from grey hydrogen to green hydrogen in a way that is affordable for them?

At the end of the day, these two themes lead to different infrastructure assets. But they are the two big drivers of our philosophy for investing in the energy transition.

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Q How important is electrification as we aim for net-zero?

First of all, net-zero is an extremely ambitious objective and we have a duty to act everywhere we can before we consider carbon capture and storage, which will probably be essential to reach that goal. We need to electrify everything that can be electrified. In our day-to-day lives, that means heating and driving – the two big ways that individuals consume energy.

We can decarbonise with renewables – or nuclear if a country considers it acceptable – but it has to be economically competitive. And renewables also create some new issues, such as intermittency and the quality of supply. We will need to work with regulators and investors to design flexibility into electricity systems to ensure we can match demand and supply. But I believe we are equipped to find those solutions.

Q How would you assess performance on electrification so far?

Europe is clearly paving the way globally. We should be grateful to the UK for not compromising on its very ambitious climate targets – the EU also. If we have affordable electric vehicles globally today, it's because the EU decided to have standards of 95 grams of

CO2/km on fleets sold by carmakers. That has meant that manufacturers have taken off-the-shelf battery technology and pushed it. The shift by carmakers like Volkswagen and GM was ultimately born in Brussels.

Where we are not so good is at the nexus between industrial capabilities, financing, investment and innovation. You see now that for successful green European companies, going down the SPAC route in the US is probably the most efficient way to raise capital. It could mean that we end up with a significant portion of European companies listed in the US. The capital able to move quickly and strongly to finance growth is not that available in Europe.

Q What about adoption in other parts of the world?

Joe Biden's win in the presidential election is good news because it will offer more opportunities to access infrastructure in the US market. It also means that the US is back in the game when it comes to green industry initiatives and capital for those.

Following Brexit, the UK could be in front of the EU on sustainability. The country may be more European at practically adopting the European sustainability directive than France, Germany or even best-in-class Finland. I think their approach will be best-in-class.

Q In which sectors do you see opportunities in electrification?

In advanced markets, such as Europe, we believe we can be one of the enablers of the transition by acting on demand. Smart EV charging infrastructure is a big theme for us and a space we expect to invest close to €1 billion into over the coming years. Our agreement

Green power in the rainforest

Q What is the energy project you are developing in French Guiana and why is it important?

We recently obtained first regulatory approval for a plant that combines solar PV with a battery, as well as an electrolyser to create hydrogen and hydrogen storage. Guiana is very reliant on fossil fuels and wants to improve its mix.

While the cost of this project is relatively high compared with a power plant in mainland Europe, in the west of Guiana, in the Amazon rainforest, this is exactly what the country needs. It will provide reliable supply to the local community during the day, as well as at night.

Q What are the challenges of such a project?

Being isolated, the French Guiana grid cannot tolerate much intermittency and needs stable renewables sources. The solution is a technical challenge, so we have a world-class EPC taking over to deliver the project. But once built, you rely on predictable solar radiation and don't have any risk of the electricity not being available.

We have also had to consider the indigenous population. We are working with the Amerindian and Bushinengués communities to develop several initiatives, such as access to electricity, telecoms and public transport. Other measures include access to education for local children and young adults, and job opportunities for adults. These actions have helped us to get the support of the community and ultimately get approval for the project.

Q What are the benefits?

In addition to energy resilience for French Guiana, the plant will help to prevent the release of 475,000 tons of CO2 into the atmosphere and provide energy for some 10,000 households in western Guiana. The project will deliver 200 jobs in construction and an additional 12 long-term jobs in one of the poorest regions. It will also contribute to the building of vocational training programmes offering high-level qualifications to the young Guianan inhabitants at the core of the energy transition. It can also pave the way for similar hydrogen power across the region.

to roll out 2,000 charging terminals – including standard and rapid charging – across Carrefour hypermarkets in France is an example of that.

Demand response is also something quite innovative. We have invested in a company in the technology space called Voltalis which enables you to cut the heating for a few seconds at peak times to reduce pressure on the grid. At the macro level, it means that in two years in France we will be able to remove the equivalent consumption of a nuclear power plant.

> *"[The UK] may be more European at practically adopting the European sustainability directive than France, Germany or even best-in-class Finland"*

Q What about those assets that deliver that flexibility to the grid?

Interconnectors are interesting assets that provide synergy between electricity grids and reduce the risk of power not being available when it is needed. We are developing an interconnector from northern Germany to southern England. It means that you could have a household in the UK using electrons coming from offshore wind in Germany and, conversely, you may have an excess of energy from offshore wind in the UK that can be channelled to Germany. If you have the capacity, you can use it across borders to optimise at an international, rather than local, scale.

Another area is long-duration storage. We see potential for hydrogen storage projects like the one we are creating in French Guiana. These projects make sense on big islands with isolated power grids – but not for the time being on mainland Europe, where they have to be adapted to reduce their cost.

We are also looking at some potential hydropower storage projects in the UK and Italy. This is still at an early stage and will take a few years to develop. But these projects have the big advantage of contributing inertia, which improves the quality of the electricity you inject into the grid.

Q How can energy transition initiatives be applied to businesses?

We are exploring energy efficiency for industrials very actively. We have a partnership with a French utility to offer biomass solutions to industrials that are still burning coal or gas, or to help them improve their boilers as they shift to green sources.

Hydrogen is first and foremost an industrial play, but it brings a lot of questions. How do you handle the counterparty risk with an industrial over the long term? How do you deal with the interface between the energy process and the industrial process of the company – because you are in the plant of the industrial. And how do you ensure you have a contract that is as robust as with a PPP? Those are questions investors have to deal with.

Q What are the risks in energy transition and how do you address those?

The fiercest competitor of a hydrogen electrolyser today will be the electrolyser built five years from now. It will be 50 percent cheaper, if not even cheaper still. But it will only exist if the electrolyser today is built first.

The only solution for an investor is a stable long-term contract. More than that, the contract needs to be balanced. You have to factor in incentives to lower the cost of the assets, such as maintaining and upgrading with cheaper and more efficient components. You have to find ways to make the whole competitive.

We need to think collectively of the long-term objectives, think collectively of the solutions and choose the smartest ones today. But we also have to be consistent in 15 years and not forget that when we built the project it was expensive – hence the remuneration we are asking 15 years from now when things will be cheaper.

The financing situation is also evolving. Tomorrow, you will have technology companies financing some things. You will have project finance. You will have green corporate finance. The financing industry is evolving because the industry and the society are evolving.

Q In what other ways can infrastructure investors support the energy transition?

A big challenge for us is to 'mainstream' the energy transition into all our assets and projects. So, when we are building schools in Wales or Finland, we make them extremely efficient from an energy perspective.

At the end of the day, this is as important from a carbon-footprint perspective as installing a new technology device to manage energy use. Traditional infrastructure owners have a lot to bring to the table because this is another area where we can make a difference. ■

Giving infrastructure investments pandemic immunity

Covid-19 has forced investors to reconsider their risk exposure as infrastructure projects around the world have been significantly disrupted. Jon Yarker investigates how portfolios are being pandemic-proofed to prepare for future lockdowns

By their nature, large infrastructure projects, from motorways and railways to dams and viaducts, require a lot of planning. However, the global pandemic caught everyone off guard and projects around the world were heavily disrupted. Vaccination campaigns may be giving some hope for normality, but infrastructure investors are still having to think about how they can protect their exposure to future pandemics.

In 2020, some sectors were hit worse than others. A collapse in oil prices meant hydrocarbons projects were among the hardest hit. According to Bloomberg, revenue from listed infrastructure projects in the oil and gas industry fell 20 percent in 2020.

"The oil and gas sector was not only impacted by the demand destruction from the pandemic, but also by the oil price war between Saudi Arabia and Russia," recalls Declan O'Brien, head of infrastructure research and strategy at UBS Real Estate and Private Markets. The oil price may have recovered but revenues for 2021 are still expected to be down by more than 10 percent.

"US shale oil production growth remains depressed, as reflected in the low rig count at key shale basins," says O'Brien. "Appetite for investments has diminished as the demand outlook remains weak, as reflected in bearish oil price futures."

Airports were hit even harder, with unprecedented peacetime travel restrictions grounding millions of flights. According to the same Bloomberg data, revenues from listed airport infrastructure fell by nearly 50 percent, making it the worst-hit infrastructure sub-sector.

> *"Transport assets such as airports and toll roads... saw their revenues fall"*
>
> **DEVAN NATHWANI**
> **SECOR Asset Management**

O'Brien is not optimistic about revenues from airport infrastructure returning until at least 2023. The roll-out of vaccines may ease this pressure, but the challenges facing airport investment are still significant.

"This will have a valuation impact versus pre-pandemic when airports were viewed as a high growth sector," he says. Although successful vaccine roll-outs could release near-term pent-up demand, a weaker macroeconomic outlook and a broader decline in business travel could impact this highly cyclical sector over the longer term.

"Overall, we saw that transportation assets were very resilient once the most severe lockdowns were lifted," adds O'Brien. "Freight-related traffic has been very robust throughout with strong port volumes, while passenger transportation volumes – air travel, passenger rail, etc – remain depressed."

Many commentators have spoken of infrastructure's continued resilience as an asset class. Devan Nathwani,

investment strategist at SECOR Asset Management, notes that while travel restrictions will have inevitably impacted transport infrastructure, other projects have been able to withstand these headwinds.

"Infrastructure as an asset class fared well throughout the pandemic, given that these projects have highly regulated revenue streams and generally resilient balance sheets," he says. "That being said, transport assets such as airports and toll roads that typically rely on high traffic volumes saw their revenues fall as governments globally enforced lockdowns and restricted travel."

He notes that, conversely, digital infrastructure assets such as fibre optics did well as office workers shifted to working from home, thereby creating a demand for better internet connections.

This boost to digital infrastructure points to a longer-term theme that investors are coming to appreciate. A way to defend against future pandemics will be to pivot exposure towards more sustainable sectors that will still be relied upon in worst-case scenarios.

Assets such as fibre optic networks could become more valuable in portfolios than holdings that are vulnerable to travel restrictions. This is the view being taken by Peter Stonor, global head of transport, infrastructure and industrials at VTB Capital. "When it comes to protection against future disruption, infrastructure investors need to be prepared to shift allocations more quickly," he says. "The pandemic has accelerated the big-picture trends that were already underway for infrastructure, perhaps by as much as 10 years."

These include the energy transition from oil and gas into renewables; digitisation, including smart, efficient infrastructure; disruptive technology; and sustainable investment. This is not to say transport infrastructure will not have a place in portfolios.

Instead, Stonor argues that investors should be prepared to be more critical about what they are holding in light of the pandemic: "Investors need to critically assess what really fits within their traditional definition of transport infrastructure in a post-covid world."

He identifies several criteria in light of this, such as whether a project provides an essential service to a community; whether there are high barriers to entry for investors; and whether it offers predictable cashflows. "To better understand the resilience of their infrastructure portfolios, investors must reassess their operational and financial leverage KPIs," Stonor says. "This will then allow these portfolios to withstand prolonged shocks such as a global pandemic."

Building an infrastructure portfolio with the resilience to survive future pandemics will not be an easy feat, and many investors will be trying to forecast what infrastructure a locked-down society will need. Fortunately, covid-19 has presented investors with new opportunities due to the unexpected side-effect of society becoming more engaged with sustainability.

According to the World Economic Forum, demand for renewable energy has surged during the pandemic as existing fuel sources have been unable to operate because of the disruption. Consumption of renewables surpassed demand for coal in the US for the first time in 130 years. In many ways, the disruption was an opportunity to showcase renewables, and the investment case for these projects has been noted.

"Consumer sentiment towards unsustainable practices has fallen even lower over the pandemic, as people have had the opportunity to consider aspects of their lives which contribute to the sustainability issues we face," says Peter Buchmann, managing director of sustainable infrastructure at Gresham House Asset Management.

"We suspect the appetite from millennials – and generations beyond – for fossil fuel-underpinned investments within their pension allocations will be very different to that of the baby boomer generation. We hope this is a driver for a more concerted institutional investor pivot towards sustainable infrastructure, with real asset-based solutions to environmental and societal challenges."

Structural issues

Although it may be possible to identify infrastructure assets that would perform poorly again in a new lockdown, simply avoiding such holdings may not be ideal for many investors. Instead, the structuring behind such projects is being evaluated and the lessons from the pandemic means additional security is being built into them.

Infrastructure in general held up well as an asset class. However, the stasis of lockdown had an impact on particular projects that were caught out by the unexpected halt in cashflow.

According to Johnny Chow, CIO at Legal & General Retirement Institutional, this has made liquidity management an even more crucial part of infrastructure investment. "With many projects delayed due to new lockdowns,

"Investors need to critically assess what really fits within their traditional definition of transport infrastructure in a post-covid world"

PETER STONOR
VTB Capital

and changes around social distancing rules for construction projects, infrastructure investors are looking to ensure there are plans in place for the project to manage construction over time," he says. "The main change has been that we are looking more into an investment's short-term liquidity facility to ensure there are plans in place to manage construction over time – for example, in case there is another delay due to a lockdown."

Though the world may be more aware of the risks pandemics pose to assets, being able to fully prepare for a genuine 'black swan' event is a near-impossible task. O'Brien is instead adopting a pragmatic view: that worldwide disruption will happen again at some point and so having a sensible attitude towards risk exposure is vital.

"Investors should take a more sensible approach to industry and financial forecasts to ensure there is sufficient downside protection against future demand or economic shocks," he says. This will involve being aware of the short-term liquidity risks an investment could face: "A conservative capital structure with extensive liquidity is the best preparation that you can have for any unforeseen event."

Liquidity concerns

Covid-19 has made infrastructure investors more wary of illiquidity, with cashflow planning now a key consideration when it comes to asset selection. Governments around the world have issued expansive stimulus packages to support their economies and flood markets with liquidity, something Hari Chandra, co-head of global power, energy and infrastructure at Cantor Fitzgerald Europe, says helped support infrastructure projects in their darkest hour.

"Around a year ago [in April 2020], I sat down with my team and said this was going to be an extremely tough period and we all need to be thinking about restructurings," he says. "A few months later, we were selling assets at their highest prices ever. That trend has been sustained for the past year."

Although this staved off a liquidity crunch, infrastructure investment has now been widely identified as a way to stimulate economic recovery. In October 2020, the International Monetary Fund encouraged member states to make the most of low interest rates and subsidise infrastructure projects.

This may present greater opportunities for private investors, but Chandra is concerned about the unsustainability of infrastructure projects thriving off such cheap leverage. He believes investors need to be more aware of this risk.

"It shows capital markets chose to ignore the shock that happened in the real economy, continuing to finance at exceptionally cheap rates," he says. "It has nothing to do with quality of projects or structuring. It has to do with a massive financial bubble that is a reaction to pandemic-related stimulus. It's like being at a party at 2am and someone orders another round of drinks. It seems like a good idea at the time, but the hangover is worse." ■

KEYNOTE INTERVIEW

More to the energy transition than renewable energy

Beyond utilities assets, waste-to-energy and recycling projects – as well as clean mobility – are key to the energy transition, says Christoph Bruguier, senior investment director at Vauban Infrastructure Partners

Q How has the pandemic impacted the energy transition agenda?

The covid pandemic and subsequent lockdown measures around the world have had a dramatic impact on our daily lives and on the economy, of course. But any direct impact on energy demand, and therefore carbon emissions, has been short-lived. Demand for energy has quickly rebounded so, in that sense, the long-term impact will be limited.

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However, the rescue packages that governments everywhere are putting in place will undoubtedly accelerate the energy transition. Indeed, at Vauban, we have conducted a review of the long-term implications of covid on our entire portfolio, in conjunction with academics. The conclusion we have reached is there are two key mega-trends that will be significantly amplified, affecting every asset we own. The first is digitisation. The second is the energy transition.

The desire to 'build back better' that governments, globally, are articulating will be a profound legacy of the pandemic. But those governments do not have the financial capacity to achieve those ambitions alone. Private capital will have a vital role to play in driving the global recovery and investing in the energy transition.

Q And will that accelerated energy transition create attractive opportunities for investment in renewable generation?

Mainstream renewable energy generation projects – in other words, wind farms and solar farms – typically no longer match the risk/return profiles that we are targeting. Competition is extremely high and IRRs have, inevitably, therefore come under pressure.

However, we see interesting opportunities in waste-to-energy and biomass. We also look to other aspects of the energy transition, seeking to partner with state-owned utilities and industrials that lack the firepower to address all the changes required to meet energy transition objectives.

Q Which sectors are particularly interesting right now?

Waste, in general, is an important theme. In addition to waste-to-energy investments, we target projects focused on the waste and water sectors more broadly, including recycling and water treatment. In fact, we formed a significant partnership with Suez last year, focused on financing projects in these industries.

We have also completed a number of district heating deals that, again, meet that profile of partnering with incumbents to provide much-needed capital to support the energy transition. For example, we have invested in a Norwegian district heating and cooling asset that uses highly efficient and environmentally friendly pumps, called Oslofjord Varme. We have completed a district heating deal in Italy as well.

Another key theme for us, meanwhile, is smart metering. Smart meters and sub-meters are important for reducing energy consumption and carbon dioxide emissions. We invested in Proxiserve, a French player in heat and water metering. Proxiserve is also involved in domestic EV charging, which leads me to the final area of the energy transition where we seek out investment opportunities – clean mobility.

We have long invested in clean mobility through rail transportation, including metros, tramways and high-speed lines. We now expect our focus on both passenger and freight rail to increase. We believe the sector is benefiting from real tailwinds as air transport, in particular, falls out of favour.

We also see it as a mitigant to road transportation. At the same time, we continue to look at developments in EV charging.

Overall, I would say that, as a long-term investor, pretty much everything that we look at is inevitably related to the energy transition in some way. But in the current market, we believe investing in the waste and water, smart metering, district heating and clean mobility sectors better meets our objectives and the objectives of our investors than investment in renewable energy generation itself.

Q Competition in the renewable energy sector is intense, but how would you describe the competitive dynamics around these other energy transition assets?

There has certainly been increased pricing pressure in certain subsectors, for example in the Nordic utilities space, where we already have exposure. One way in which we are able to mitigate that risk, therefore, is to benefit from the platform that we have already established, seeking out add-on acquisitions rather than targeting new independent assets.

Another important differentiator, meanwhile, is our stakeholder-centric investment approach – our ability to partner with industrial companies and the public sector, just as we have with Suez in France and with some of the publicly owned Nordic utilities.

Finally, because we are a long-term investor, with 25-year horizons, we are able to avoid some of the returns pressure that has crept into more heated

"Only around a third of the technology required to meet 2050 targets even exists today"

Case study: Proxiserve

Initial investment: March 2019

Proxiserve is a leading player in the resilient and growing French market of smart metering and energy services. It provides installation, maintenance and sub-metering services for heating and water equipment in joint properties and public collective housing in France. Proxiserve also installs and maintains heating systems and boilers – as well as electric vehicle charging stations, with more than 70,000 installed to date. Finally, through its Edenkia brand, the group provides energy solutions, electricity supply and sub-metering to large tertiary sites.

The company is expected to grow steadily in the coming years, benefiting from the political support for energy transition devices and the adoption of the energy transition law requiring the installation of heat meters in collective buildings.

"Private capital will have a vital role to play in driving the global recovery and investing in the energy transition"

Case study: Oslofjord

Initial investment: April 2018

Oslofjord Varme is a leading independent Norwegian district heating company that builds, owns and operates heating and cooling systems in the Greater Oslo area. With a production capacity of around 308MW, the company utilises highly efficient and environmentally friendly heat pumps that produce around three units of heat per unit of electricity consumed.

Vauban's investment in Oslofjord Varme has been made through a joint venture alongside Infranode and Kommunal Landspensjonskasse. Through its Core Infrastructure Fund II it is investing in a 25-year ownership horizon and has 42.5 percent stake in the company. Oslofjord Varme also holds joint-venture interests in Norwegian district heating companies Drammen Fjernvarme (50 percent) and Fredrikstad Fjernvarme (57.5 percent).

In collaboration with the management and co-shareholders, Vauban has created an impact framework for OsloFjord Varme that measures the environmental, social and governance indicators of the asset. In line with the UN's Sustainable Development Goals, the reporting framework measures both qualitative and quantitative elements related to OsloFjord Varme's fossil fuel use, renewable energy use, biodiversity protection action plans, and worker health and safety management systems.

parts of the market, by looking at other areas of the energy transition that some have deemed less attractive in the short term due to covid, such as clean mobility.

Q What is your approach to assessing and mitigating regulatory risk?

Regulatory risk has clearly played an extremely important role in the evolution of the renewable generation sector, where subsidies were pervasive until a more recent shift towards a merchant environment. But the areas where we operate, such as clean mobility or waste-to-energy, for example, do not have the same sorts of regulatory exposure on pricing.

In these areas, the regulatory environment progressively provides incentives to the energy transition without heavily subsidising the asset. Of course, we are extremely careful about assessing regulatory risk, but the pressures are not the same as for the wind and solar generation industries.

Q What are you seeing in terms of the appetite for energy transition assets among underlying investors?

The appetite from underlying investors is definitely increasing and has been since the start of this journey, now over a decade ago. There is no doubt that investing behind environmental themes is important for the pension funds and insurance companies that commit to our vehicles, as it has become increasingly front-of-mind for their own stakeholders. And just as governments have increasingly embraced the role that the public sector must play in driving the transition, there is also a growing emphasis on the role of the financial services sector.

I would add, however, that the energy transition has always been integral to our strategy. That goes back to us being a long-term investor, focused on the resilience of our assets over time. It has not taken a change in public sentiment, increased regulatory pressure or demands from our limited partners for the energy transition to become part of our central investment ethos.

Q What new energy transition opportunities lie around the corner?

We expect the intensity of the energy transition to continue to increase over the next decade. We also expect the scope of the energy transition to broaden. No industry or asset will remain untouched, particularly in the infrastructure arena.

But, at the same time, it is important to remember that there is still a long way to go. Only around a third of the technology required to meet 2050 targets even exists today – two thirds of the necessary technology has not yet been developed to the point that it is ready to be deployed at scale.

Emerging technologies including hydrogen and carbon capture systems will have a critical role to play. Indeed, we are already starting to see opportunities, for example to include carbon capture in waste-to-energy assets. ■

Transmission – a missing link in the transition?

Transmission mega-projects in Africa are gaining attention but regulatory reforms are needed to entice investors, writes Ben Jackson

The energy transition depends not only on generating green power, but on moving it from wind farms, hydro facilities or solar plants into homes and factories. In Africa, however, the relative dearth of transmission infrastructure is a key impediment to connecting consumers to electricity of any sort, including new forms of renewable generation. The World Bank estimates that Africa needs to invest at least $3.2 billion a year up to 2040 in its transmission network.

There is no shortage of projects and schemes that aim to strengthen transmission on the continent, some of which even envision supplying African energy to Europe. But investors seeking to harness the immense power of Africa's renewable resources must overcome multiple regulatory, logistical and financial hurdles in the transmission space before their dreams can become reality.

Mega-projects struggle

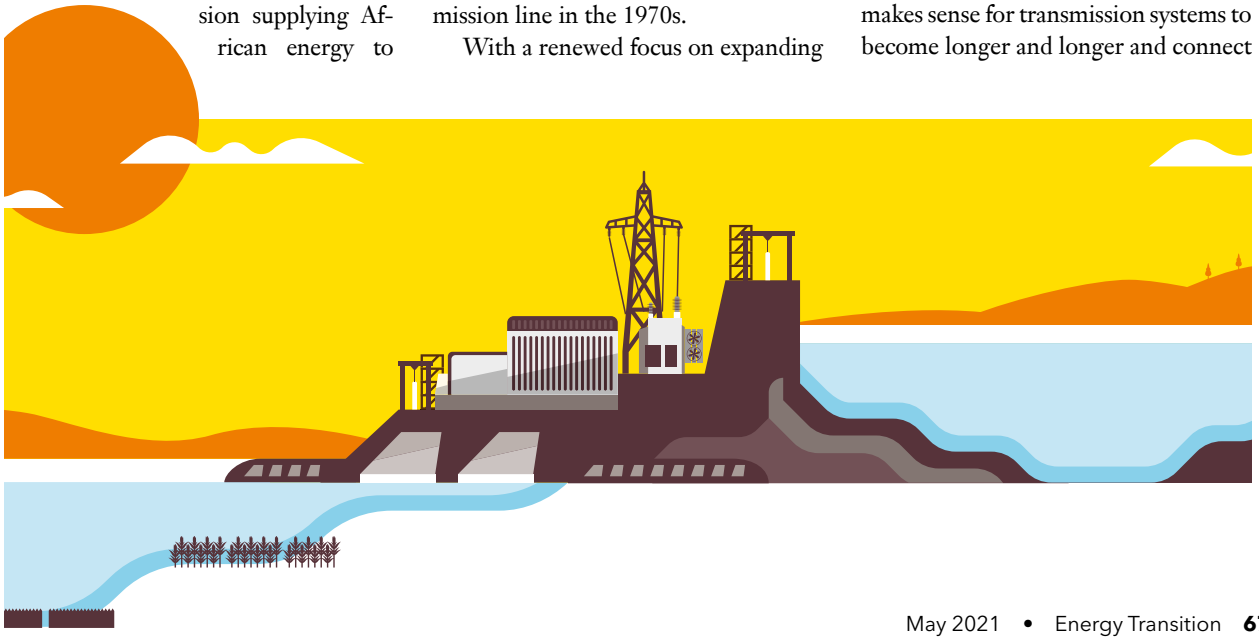
Cross-border transmission in Africa "has been happening for decades and quite successfully", says Koffi Klousseh, managing director and head of project development at Africa50, an infrastructure investment platform established by the African Development Bank.

South Africa, for instance, first benefitted from hydroelectric power generated in Mozambique and transported via a high-voltage, direct current transmission line in the 1970s.

With a renewed focus on expanding generation capacity, many countries in Africa "may end up having capacity they cannot use", says Klousseh, meaning there is "greater interest in ensuring that interconnections are in place to wheel surplus to areas experiencing power deficits".

A particularly ambitious scheme to supply surplus energy from Africa to Europe is being advanced by UK-based company Xlinks. The start-up aims to generate 3.5GW from onshore wind and 7GW from solar PV in Morocco. Power would then be exported to the UK via the world's longest subsea HVDC cable.

Richard Hardy, a senior project developer at Xlinks, says: "The technology is advancing at such a pace that it makes sense for transmission systems to become longer and longer and connect



a broader variety of different markets."

Hardy acknowledges that the scheme faces logistical difficulties in sourcing the required materials to manufacture the subsea cable. And although there are unanswered questions over the financing arrangements, Hardy insists that "sustainable energy projects that have been developed in the right way are highly attractive to investors at the moment – there is a lot of capital looking to be deployed in this area".

Norman Waite, an energy finance analyst at the Institute for Energy Economics and Financial Analysis, agrees that intercontinental transmission schemes are "realistic from a technology standpoint". In fact, Morocco already exports solar energy to nearby Spain via a 50km transmission line.

However, Waite cautions that an undersea cable can cost 10 times as much as an above-ground line. Although he believes Saharan solar is eventually "likely to yield energy costs so low they justify the expense", he says larger-scale exports of power to Europe "might be some time away", given the technical and financial challenges.

Another scheme with monumental ambitions is the latest stage of the Democratic Republic of Congo's Inga hydroelectric project, known as Inga III, which aims to generate up to 11GW from the Congo River.

Such large-scale hydroelectric schemes come with vast price tags, which means the projects become "financially more viable the larger the market is", says Klousseh. "Extensive transmission lines, including cross-border, are imperative."

South Africa controversially agreed to purchase 2.5GW of electricity from Inga III in 2013. But connecting the unbuilt mega-project to South African consumers is set to pose an enormous challenge.

"Conservative estimates put the cost of transmission lines from Inga III to South Africa at upwards of $4 billion," says Indigo Ellis, associate director at Africa Matters, a strategic advisory firm. Ellis doubts the capacity of Eskom, the troubled South African utility, to fulfil its promise to pay for the 2,000km of transmission lines needed for the project. She points out that Eskom "is in dire financial straits and is unable to finance much-needed repairs of its own dilapidated and ill-constructed power stations".

Any prospect of attracting investors to support the financing of the project are hamstrung by social and environmental concerns around the dam itself. "Community resettlement around the project has been a thorny issue," says Ellis, and the need to uproot as many as 37,000 people is "liable to dissuade ESG-minded investors" from funding the project.

Regulators shy away

The urgency of strengthening the power sector, including the transmission network, is illustrated by the fact that only around half of people in sub-Saharan Africa have access to electricity and supply is often unreliable for those who do have a grid connection. Africa also has the highest transmission and distribution losses of any region, with an average power loss of 23 percent.

Even Ghana, one of the continent's

India's blueprint for transmission investors

"India is a success story," says Norman Waite, an energy finance analyst at the Institute for Energy Economics and Financial Analysis, noting that since reforms introduced in 2006, "private sector participation has helped modernise the grid and thereby increase the uptake of renewable energy".

Harsh Shah, chief executive of IndiGrid, a KKR-backed transmission company operating in the country, adds that "at the end of the day, transmission costs are very minuscule for customers".

According to Shah, India's ability to attract sustained investment in transmission infrastructure is down to the fact "the regulatory framework has been robust and stable". Service agreements are standardised across the country and there is a clear policy favouring competitive bidding on all transmission auctions.

The mechanisms to ensure payment security have been crucial to the success of the IPT model in India. Revenue paid to inter-state transmission line owners from generating stations is pulled into a single account and shared pro rata with the transmission companies. Shah says this model "diversifies the customer base so much that the impact of a payment delay goes materially down for any transmission line owner".

As one of the world's largest electricity markets, India has powerful advantages in terms of being able to diversify risk for transmission operators. Moreover, it can draw on well-capitalised domestic conglomerates eager to enter the sector. Waite says: "India provides a globally relevant model for other emerging markets to drive down cost while creating a more sustainable domestic electricity generation system."

Shah agrees, but notes there is room for improvement in how India manages its electricity sector, particularly as it is much quicker and easier to add generating capacity from new solar plants than it is to construct the necessary transmission infrastructure. "India has been planning reactively," he says. "One of the things that India can do better is ensure that we build capacity proactively, keeping in mind the requirements of the new grid."

"First-mover projects will always, especially in emerging markets, require a lot of security and support and credit enhancement to make them work"

ISAAC OTOLO
PwC

most successful economies, has endured a dysfunctional power market for many years, with nationwide blackouts in early 2021 blamed on GRIDCo, the national transmission company. Yet financing improvements to the grid appears to be beyond the government, which accrued a fiscal deficit amounting to almost 14 percent of GDP in 2020.

"There isn't the fiscal space to invest hundreds of millions, or billions of dollars, in transmission networks," notes Kobi Annan, a consultant at Songhai Advisory, based in the Ghanaian capital Accra.

Yet in Ghana, as in almost all African countries, opportunities for private sector participation in transmission infrastructure remain limited. Several other emerging market economies, including Brazil and India, have adopted the independent power transmission model, which involves governments auctioning contracts to construct and operate new transmission lines. But in Africa, policymakers have been reluctant to allow private sector participation.

"The grid is a state-owned asset," says Felix Ndi-Obiosa, of counsel for Africa at law firm DLA Piper. "African leaders are wary of effectively giving up control over a national asset to foreign players – there's a lot of sensitivity around that."

Klousseh adds that the role of vertically integrated utilities, which still dominate the power sector in most countries in sub-Saharan Africa, "limit financing for transmission to governments, development finance institutions and export credit agencies".

And allowing private sector participation in the electricity value chain in Africa has not always gone to plan. Ghana's recent experiment with privatising the electricity distribution network ended in fiasco, with a concession awarded in March 2019 but then withdrawn months later over a contractual dispute.

Kenya to open door

Kenya has become the first country in sub-Saharan Africa to introduce reforms to facilitate the IPT model. Although the Kenyan government has yet to finalise any concessions, Klousseh says Africa50 is pursuing a project with Indian utility Powergrid to take over three transmission lines in the country. "Using an innovative PPP structure, we hope it may set a precedent for IPTs in Africa," he says.

Torbjorn Caesar, senior partner at Actis, is certainly enthusiastic about the opportunities that may eventually materialise for long-term infrastructure investors to finance transmission lines in Africa. Citing the success of several other emerging market countries that have privatised transmission, Caesar insists that "the risk is very, very low" for investors in transmission networks, particularly in countries with burgeoning demand for electricity.

"To deliver something that is in short supply is, in general, a lower risk than delivering a product that is in oversupply," he says. In countries such as Kenya, Caesar believes, "the perceived risk is higher than the actual risk".

Meanwhile, Isaac Otolo, a director at PwC in Kenya, says the country's success with independent power producers generating wind and solar power can provide a blueprint for IPT investors. He believes the key step for the transmission sector will be finding an anchor investor.

"First-mover projects will always, especially in emerging markets, require a lot of security and support and credit enhancement to make them work," he says. "The first investors need to be brave and take the plunge." ■

KEYNOTE INTERVIEW

'An energy infrastructure roll-out of unprecedented scale and pace'

The transition is poised to move beyond green power generation as the tumbling cost of renewables paves the way for industry's decarbonisation, says David Scaysbrook, Quinbrook Infrastructure Partners co-founder and managing partner

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Q How is the energy transition narrative evolving?

Over the past 20 years, we have seen renewables targets move from 1 percent to 50 percent, and even 100 percent in certain economies. At the same time, we have seen the cost competitiveness of renewables improve dramatically, creating significant additional opportunities beyond the decarbonisation of the power sector.

With the increased penetration of renewables on the grid, we have also seen a whole range of unintended consequences around grid stability. That has created interesting applications for energy storage. The confluence of these two trends mean we have now reached a new stage of investment opportunity that takes us well beyond the conventional wind and solar projects that have dominated the investment landscape over the past decade.

Q What type of investment opportunity is that creating, and where?

The UK is a leader in modernising the grid to take on significant additional renewables. A good example is a project of ours in Wales, where we have installed the first privately funded synchronous condenser (a type of flywheel) in the UK market.

That is a 100-year-old technology that is being used to help stabilise the new renewables-dominated power grid, which is somewhat ironic! That investment is supported by a long-term contract with the National Grid, and we fully expect to see more of these systems procured – not only in the UK, but also in other countries around the world that are currently lagging in grid-support initiatives.

Synchronous condensers help manage power system distortion which arises when the UK is now taking intermittent wind power produced in remoter regions such as the north of Scotland, for example, or offshore wind from the

Energy transition in action

Grid stability

In 2020, Quinbrook Infrastructure Partners joined forces with Welsh Power to provide the UK's National Grid with much-needed grid inertia thanks to the installation of a synchronous condenser and flywheel at Rassau in Ebbw Vale. The facility in South Wales will be able to provide approximately 1 percent of the inertia required to operate the UK grid safely – with zero emissions – within 15 minutes of an instruction. This tried-and-true technology will stabilise the operation of the power grid which, in turn, will allow more intermittent renewable electricity to be used on the network as older baseload coal, gas and nuclear plants are retired. The new plant is expected to be operational by late 2021.

Solar and storage: a winning combination

In December 2019, Quinbrook secured a 25-year power purchase agreement with NV Energy for its Gemini solar and battery storage project in Clark County, Nevada. Gemini is one of the largest projects of its kind, globally, with plans to host 690MW of solar PV arrays located on up to 7,100 acres, coupled with battery storage infrastructure. The project is expected to exceed $1 billion in capital expenditure and will capture and store solar energy during the day in order to dispatch it during the early evening peak period when power demand surges. Once built and operational, Gemini is expected to reduce carbon emissions by 1.5 million tons per year.

Greening industry

At the end of last year, Quinbrook formed an innovative joint venture with Birch Infrastructure to develop and construct renewables-powered hyperscale data centre campuses in the US. The data centres will benefit from a low-cost, around-the-clock, renewable power supply, together with back-up resiliency solutions. The aim is to assist data centre operators in meeting their accelerating carbon-reduction and net-zero targets with low-cost renewable power. The joint venture has ambitious targets, with a current development pipeline more than five times the new data centre capacity added in the US in 2020 alone.

East Anglia coast or solar produced in Kent or Cornwall, and transmitting it to the larger population centres where that power is consumed.

In many ways, today's scenario is the exact opposite to how the UK grid was originally designed. Historically, coal was mined in a central location, the Midlands, and then taken to the extremities of Britain in a hub-and-spoke type transmission model. This is now entirely reversed and is a great example of the new types of long-term energy-supportive infrastructure that must be developed and funded. They are ancillary, but still necessary, to the energy transition.

In addition, we believe that battery storage will be transformative. Battery costs have already come down substantially, but we also expect to see some important technological developments taking place, in terms of different battery chemistries, the extended duration of those storage technologies and therefore the ability to harness cheap renewables, and then store and re-transmit them as well. That is a game changer because historically electricity has not been a storable commodity.

Q How do you anticipate the regulatory environment around these themes developing?

The historical regulation of power markets has been designed around the instantaneous settlement of supply and demand. Battery storage changes that fundamentally, because we now have a technology that can store surplus renewable energy and then redispatch it at a later point in time. Battery storage will enable us to overhaul the rules that govern how electricity price formation, and therefore value, are determined.

We do, therefore, believe that significant regulatory change is inevitable. But the direction of that change will be to continue to support the harvesting and storage of low-cost renewable energy. All in all, we believe that the marriage of the relatively cheap, inert and proven technology that is solar PV, combined with proliferating battery storage technology, means that solar teamed with battery storage is currently the 'engine room' of the energy transition.

Indeed, we are convinced that the scale of the opportunity will exceed expectations and will become the single largest renewables tech proliferation that we will see, at least over the next five years. The reason I say that is that it enhances the economic value and efficiency of solar substantially, both at a utility scale – as evidenced by our milestone-setting Gemini project in Nevada – through to smaller projects installed in thousands of factories and manufacturing facilities, producing resilient and carbon freepower behind the meter. This ability to provide both a grid-scale and a local, distributed solution is the reason we believe solar combined with battery storage is the number one game in town.

Q Are we about to see even more ambitious carbon reduction goals?

In 2007, before the financial crisis, there was a significant push around

"This momentum we are seeing, combined with the sheer cost competitiveness of renewables, will ignite the decarbonisation of industry on a global scale"

emissions trading, the global regulation of carbon and climate change targets in the US. There were Democratic state governors all the way from the Canadian border to Mexico who were fervently hoping to achieve what we are, in fact, only seeing now, some 14 years later.

The ambition was there back then, but the regulatory and political headwinds were too great to overcome. Today, however, I believe there is no question that, between the announcements from the Biden administration and other potential announcements that may come out from other countries in the run-up to COP26 in November, we will witness a level of commitment to decarbonisation that has never been seen before.

Q Do you think those commitments will extend beyond the decarbonisation of power generation to the accelerated decarbonisation of industry?

I absolutely believe that this momentum we are seeing, combined with the sheer cost-competitiveness of renewables, will ignite the decarbonisation of industry on a global scale. Unsubsidised renewables are being priced significantly lower than conventional power. There are still issues to be overcome around the maintenance of 24/7 renewable power – there is still a technology and cost problem to be solved there. But, for 18 hours a day, it is possible to access extremely competitively priced renewable energy, and I think that factor alone will take net-zero goals beyond the power sector.

That is what is really exciting. This is no longer just about replacing the existing stock of fossil generation with renewables. We are now talking about using large-scale renewables and, in particular, solar together with battery storage, to power brand new green data centres, new green steel manufacturing, green ammonia manufacturing, new refineries and zero-carbon aviation fuels, and that is just the beginning.

Green hydrogen is probably attracting the most attention right now, but hydrogen represents just one part of this story. This greening of industry doesn't hinge on regulatory stimulus from a pure economics perspective. There is no government intervention required at the most fundamental level of it all because it makes financial sense and is economically rational. Between the investment community helping to fund and create this new infrastructure and the exploding demand for zero-carbon power from industry, this is going to be an energy infrastructure roll-out of unprecedented scale and pace.

Q What role do you expect institutional capital to play in that roll-out?

The role of institutional capital will be fundamental and mission-critical. We all know there is a significant amount of debt available for infrastructure projects in the debt capital markets and emerging green bond markets, as well as the traditional banking sector.

But, on the equity side of the equation, the absolute percentage of alternatives allocations currently earmarked for renewables is minuscule. It really is the very tip of the iceberg.

You only need to look at the $4.8 billion renewable energy fund recently closed by BlackRock. That is a fantastic achievement, certainly. But it is hard to believe that that is the single largest dedicated renewables fund that has been raised in the world to date, when you consider the trillions of investment required between now and 2030, which is only nine years away.

There can be no doubt that the global institutional investor community now needs to proactively embrace new low-carbon infrastructure – and renewables, in particular – in order to achieve the world's critical and increasingly urgent energy transition. Without those institutional investors playing their part, 'net-zero' by whenever just can't happen. It is as simple as that. ■

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ENERGY TRANSITIONING

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