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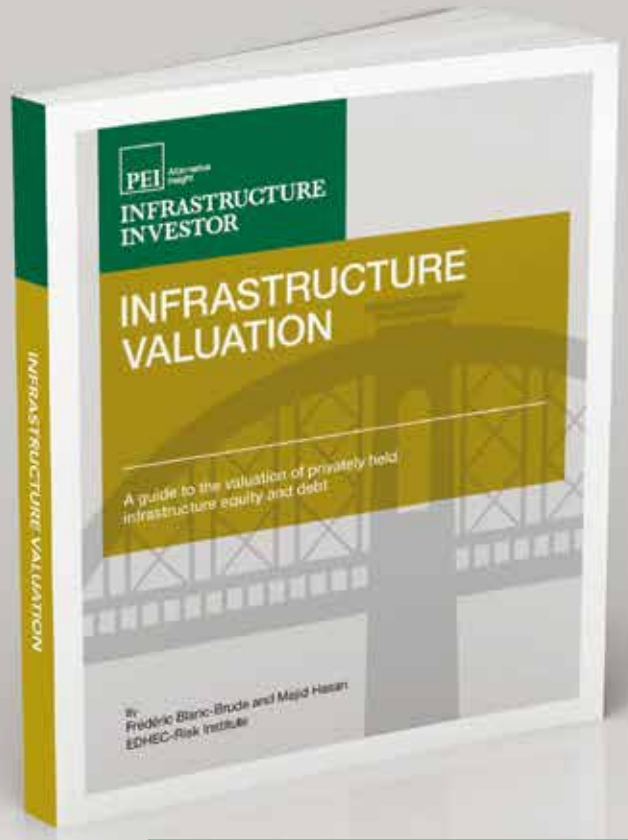

THIS BOOK

- Identifies the important dimensions of a very ill-defined and little understood topic - infrastructure investment.
- Details the challenges faced by investors with regards to valuation and risk measurement and proposes a way forward.
- Demonstrates two academically validated asset-pricing models - one for debt, one for private equity - that have been developed with practical and industrial implementation in mind.
- Explains what data should be collected to be able to run these asset-pricing models.

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A market reaches maturity

EDITOR'S LETTER

BRUNO ALVES
INFRASTRUCTURE INVESTOR
SENIOR EDITOR

WE'VE LOST track of the number of times we've heard infrastructure professionals – especially those involved in energy – sigh at the prospect of having to navigate a renewables world powered by subsidies.

On the one hand, everyone recognises the role subsidies have played in propelling renewables to the mainstream of investment. On the other, subsidy-backed renewables introduced a layer of regulatory risk that experienced players could have done without. "Give me market risk any day," they would say wistfully. Well, that day has finally come.

> "If there is one overarching theme permeating our second Energy Transition Report it's that the energy transition is itself in transition"

If our second Energy Transition Report has one overarching theme, it's that the energy transition is itself in transition.

That is nowhere truer than in the engine room, as renewables shed their dependence on subsidies to become more of a merchant power play.

For many – like our p. 18 roundtable participants – this is a long-overdue development. But it's not embraced uniformly across the industry. Many investors who are 'sold' on renewables' subsidy-backed stability are discovering that the asset class they want to pile into is, at the very least, a house of many mansions, as bfinance's Anish Buthani outlines on p. 6. But as Quinbrook's David Scaysbrook warns on p. 32, the sector's rapid evolution is also throwing up risks that some players may not be pricing in correctly. What's more, power-purchase agreements – often seen as a good way to lock in the kind of long-term investment visibility that subsidies used to generate – should not be seen as a panacea. As our p. 28 feature shows, these are complex arrangements that have yet to be standardised and carry their own risks.

These were elegantly summed up by Finadvice's Jeffrey Altman: "People believe in the sanctity of PPAs and think they have a locked-in price for the full term of the agreement. But there are instances that allow or require these agreements to be renegotiated. Most PPAs can't be broken, but they can be renegotiated." Buyers beware.

Elsewhere in the report, we bring you insights into markets as diverse as Australia – a territory fraught with political risk but where above-average returns can be found, as you can read on p. 12; Mexico, where InfraRed is pursuing a greenfield strategy, as told on p. 24; and the growth markets Actis calls home, which are anchored by a type of demand that is qualitatively different from the energy displacement taking place across the more developed world (turn to p. 8 to find out more about that).

And if you want to veer off the beaten track, Aquila makes a strong case on p. 36 for the advantages of small-scale hydropower.

Enjoy the report,

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Infrastucture Investor

Energy Transition Report

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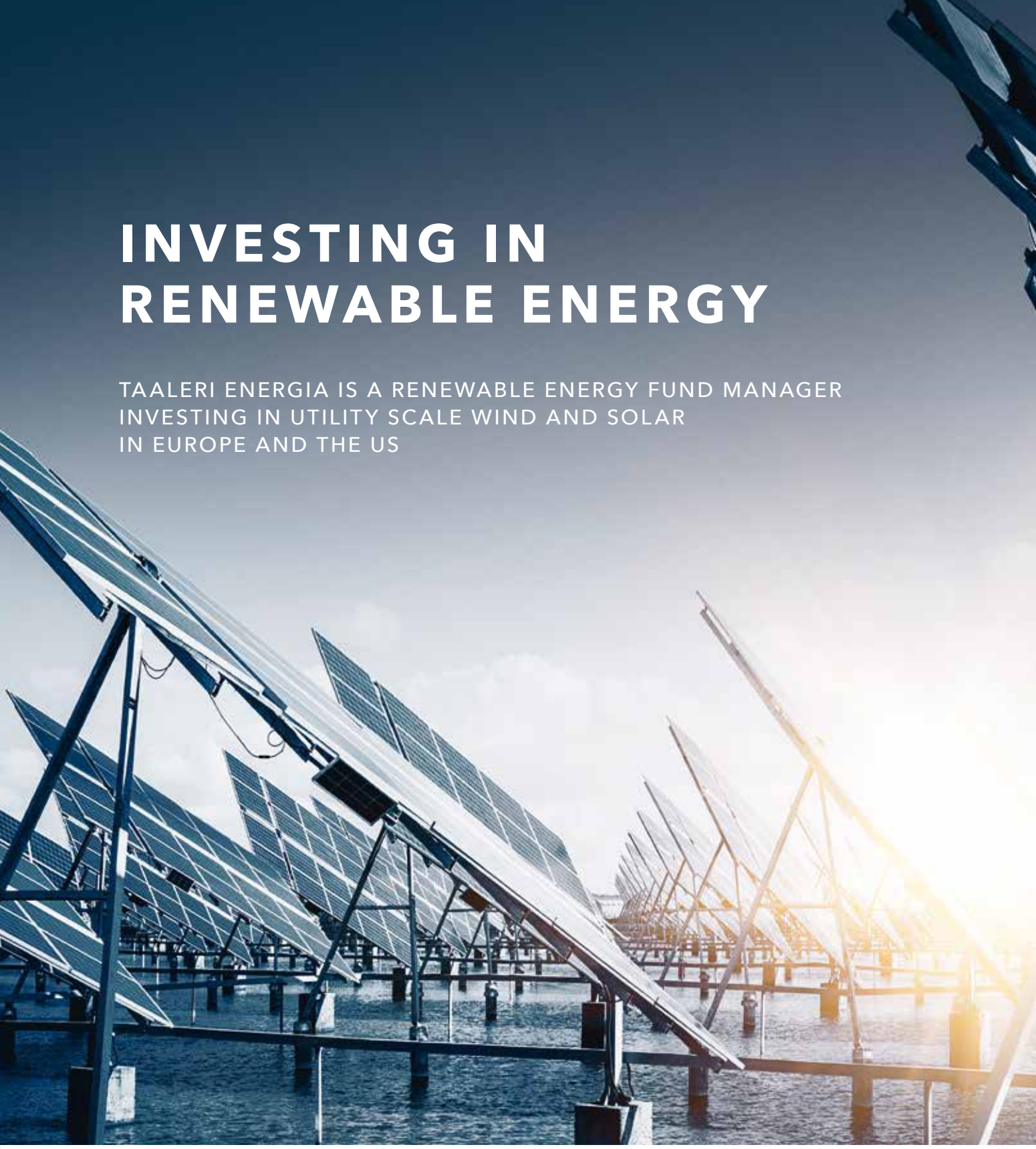

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A YEAR IN CLEAN ENERGY

Top stories in 2018

EQUIS EYES $1BN INVESTMENTS IN TAIWAN

Singapore-based Vena Energy (formerly Equis Energy) is looking to invest more than $1 billion in Taiwan's renewable energy space, following the commission of a 5MW solar plant at the end of 2017 that will be the largest ground-mounted facility on the island.

The renewable energy IPP, which infrastructure private equity manager Equis Group is selling to a consortium led by Global Infrastructure Partners in a $5 billion deal, is one of Taiwan's largest developers. It has a 122MW portfolio of solar assets under operation, construction and advanced development and a pipeline of utility-scale solar and wind projects with 571MW capacity in development over the next five years.

DENHAM POWER FUND TARGETS 1GW WITH AFRICAN PLATFORM

Denham Capital has launched an African investment platform with developer Themis, targeting the development of gas and renewable projects with more than 1GW combined capacity through equity investments totalling $250 million.

The pair will incorporate a new company, Neo Themis, in Morocco. Its first project, the 44MW Singrobo hydro facility in Ivory Coast, is expected to begin construction before the summer. Denham said Themis is developing about 400MW across Africa and the pair have set a medium-term target of 1GW of both renewables and gas projects.

JANUARY

MARCH

APRIL

JULY

CIP DOUBLES INVESTORS WITH €3.5BN CLOSE

Danish investment group Copenhagen Infrastructure Partners has reached the €3.5 billion hard-cap on its third fund following commitments from 42 investors.

CI III closed €500 million above its target and is €1.5 billion larger than its predecessor, which garnered investment from 19 LPs. Nearly all of CI II's LPs have recommitted, except for Danish philanthropic group Villum Fonden. Australian, Taiwanese, Israeli and Swiss pension and insurance groups are among the new investors, adding to capital from Denmark, Sweden, Norway and the UK.

The final close comes about a year after Danish pension funds DIP, PensionDanmark and Lægernes Pension, in addition to Norwegian counterpart KLP, brought the fund to a first close by raising €1.2 billion.

SPARX HITS $424M FINAL CLOSE ON JAPANESE BROWNFIELD FUND

SPARX Group has announced the final close for its new brownfield renewable energy fund on approximately ¥47 billion ($423.6 million; €363.5 million).

The SPARX Renewable Energy Brownfield Fund was launched in November 2017 and will be managed by SPARX Asset Trust and Management Co, a subsidiary of SPARX Group. Investors in the fund include SPARX Group itself and a raft of LPs.

SPARX Group said the Renewable Energy Brownfield Fund is a closed-ended vehicle with a term of 20 years and a target IRR of 5 percent. Its investment period will last until 31 October 2020, with capital to be deployed in brownfield projects in Japan.

PARTNERS GROUP BOLSTERS AUSTRALIAN WIND PORTFOLIO

Partners Group has acquired a 100 percent stake in the first stage of the Murra Warra wind farm in Australia for "over A$200 million" ($142 million; €123 million).

Partners Group is acquiring Murra Warra I from renewable energy company Renewable Energy Systems and Macquarie Capital, in what was the latter's largest Australian renewables investment to date. The exact price paid by Partners Group has not been disclosed.

Located approximately 30 kilometres north of Horsham in Victoria, Murra Warra I will have a total nameplate capacity of 226MW. It will generate enough energy to power 220,000 Australian households and offset more than 900,000 tonnes of carbon emissions every year upon completion, which is scheduled for mid-2019.

BLACKROCK CREATES APAC RENEWABLES ROLE

BlackRock expects renewable assets in Asia-Pacific to account for more than 50 percent of its renewable energy portfolio in the next few years, Charlie Reid, its newly appointed head of renewable energy in the region, told *Infrastructure Investor*.

"I would be disappointed if we haven't committed around $5 billion of capital to the APAC region over the next five years, given the scale of the opportunity and the pace at which it's moving," he added.

BlackRock currently manages two renewable energy funds with a global mandate. Reid said the firm might consider launching an Asia- or country-focused renewable investment vehicle, but declined to disclose further details.

SEPTEMBER OCTOBER NOVEMBER DECEMBER

ØRSTED WARNS TAIWAN ON PROPOSED TARIFF CUT

Danish developer Ørsted Energy, one of the main players in Taiwan's offshore wind industry, warned that a proposed cut in feed-in-tariffs for the sector in 2019 could have "a negative impact" on its investment plans in the region.

The government in November announced a proposed feed-in-tariff for offshore wind of 5,106 new Taiwan dollars ($165; €145)per MWh for 20-year PPAs implemented in 2019.

The figure is 12.7 percent lower than 2018's FiT of 5,850 new Taiwan dollars per MWh.

Ørsted is developing four sites for offshore wind in Taiwan, with a potential total capacity of 2.4GW.

AUSTRALIAN RENEWABLES BOOM DESPITE POLICY UNCERTAINTY

Australia's renewables industry experienced a record year for investment and construction in 2018, according to the country's Clean Energy Council.

The latest figures from the CEC, the main industry body for the clean energy industry in Australia, show that 14.6GW of new renewable energy projects are under construction. This figure includes more than 80 wind and solar farms that are either being built or on which construction is about to begin. The total value of projects under way is double that at the end of 2017, with the total value of projects completed or under way in 2018 standing at A$26 billion ($18.7 billion; €16.5 billion). Wind and solar projects make up A$6 billion of that.

Energy transition's engine is in transition itself

Once a niche, renewables investing has exploded. **Anish Butani**, bfinance's private markets director, examines the risk-return spectrum and the challenges posed by ESG and the end of subsidies

JUST LIKE CONVENTIONAL private infrastructure, the renewable energy infrastructure space incorporates a wide variety of strategies spanning the risk-reward spectrum: at one extreme we find contractual, stable and income-generative (quasi bond-like) investments; at the other end we find a more development- and construction-oriented flavour. Target net IRRs on funds range from 6-8 percent for conventional renewable technologies in developed markets to more than 20 percent.

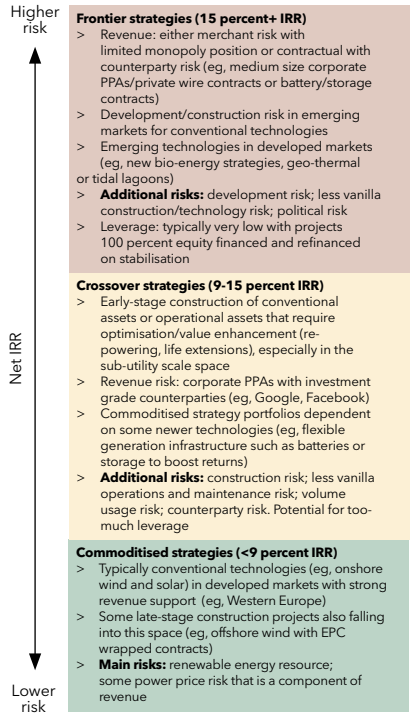
Yet, unlike classic infrastructure, which provides a substantial middle ground of modest value-add or high core-plus deals, renewable energy infrastructure is more polarised between two extremes. Indeed, how much 'value-add' can a manager provide once a wind farm is operational? Inevitably, many of the higher-return strategies involve entering projects at earlier stages of the lifecycle or venturing into those less proven segments of renewables.

BARBELL BLEND

Although a number of managers do offer funds targeting an intermediate return outcome, these portfolios are likely to be comprised of a barbell-type blend of conventional renewables and more opportunistic strategies rather than deals which individually deliver net IRRs around the 8-12 percent mark. This means that the decline of subsidy arrangements does not only affect those funds with more modest IRR targets but those in the intermediate space.

The chart illustrates some of the available sub-strategies along risk-return axes. We classify those at the bottom as 'commoditised strategies': here we find the solar and wind projects with cast-iron economics and cast-iron government support. This segment is characterised by established facilities, conventional technologies and part-guaranteed revenues, particularly in Western Europe. The bucket also includes some late-stage construction projects, such as those with EPC wrappers (whereby the contractors, rather than the developer, bear the bulk of the risk).

RENEWABLES' RISK-REWARD SPECTRUM



Source: bfinance

As we travel up the risk-reward spectrum, we see investors turning up various risk dials in search of higher returns. These include: similar strategies but with newer technologies, such as storage or energy-from-waste (operational/maintenance risk); deals in developing markets (political risk); and conventional technologies but at an earlier construction stage (construction risk).

In addition, there is the potential for excessive leverage in view of those increased risks. We refer to these as 'crossover strategies' because they tend to involve a more conservative aspect (eg, a well-established technology) and a more aggressive aspect (eg, more construction risk).

Investors should carefully scrutinise manager capability for a move towards greenfield investing. This is not always robust.

FAIRWEATHER FRIENDS

Storage and intermittency are particularly powerful themes at present: the wind does not always blow, the sun does not always shine. While renewables are becoming relatively mainstream, the infrastructure around these technologies – batteries, ecosystems to facilitate energy transition, infrastructure to cope with unanticipated fluctuations in voltage – is still rather nascent.

For example, we see managers that are investing in gas-peaking facilities alongside renewables to create an integrated offering that bridges the gaps. These projects are often exposed to merchant power price risk but benefit from their monopoly position that requires them to provide capacity to the grid.

Renewables: no longer an easy fixed-income replacement

At the top of the chart, we find 'frontier strategies'. Examples may be deals with sole exposure to merchant power prices; newer technologies, such as geo-thermal or bio-energy; projects in emerging markets involving construction risk; and conventional projects in mature markets involving more development risk. Much of this segment is developer-led, with some indeed either launching funds or partnering managers.

IS THE BOTTOM FALLING OUT?

We are currently in the last wave of subsidy arrangements for renewable energy projects. The UK, for instance, saw the final wave of ROC-approvals during the last two years. While there will still be some assets coming through the construction phase, and the market for trading these assets will continue, the lack of new creation will lead to overall shrinkage in supply. In addition, we see the returns on these assets undergoing compression: they are already down to the 6-7 percent mark in the UK and even lower in France and Germany.

What will be at the 'bottom' of our chart in the new, post-subsidy universe? We see managers increasingly exploring corporate PPA deals, whereby large companies underwrite long-term agreements to purchase a certain amount of power at certain rates. This type of arrangement is quite mainstream in the US (circa 8GWh of corporate PPAs were entered into in 2018, according to the Green Investment Group) and more nascent in Europe. At present, they sit somewhere in the middle of the available risk-reward spectrum. It is worth taking time to think carefully about the risks involved and, in particular, how many corporates today will still be here in 30 years' time.

If one were to play devil's advocate for a moment, one might see the decline in availability of deals at the lower-risk end of the spectrum as an opportunity for those prepared to play in the somewhat higher-risk territory. This might involve taking projects through development and construction (as well as securing long-term revenues) and selling these on to patient long-term investors looking for an annuity stream.

There are some very compelling opportunities available at present at this end of the spectrum. In the US, for example, certain tax incentives will begin to be phased out from 2021, producing a raft of available deals where investors can develop projects and essentially play a cost-of-capital arbitrage.

Renewable energy funds, like other thematic strategies, have benefited from the rising interest in ESG broadly and impact investing in particular. Yet, ESG credibility is not straightforward. While renewables may appear to represent an easy way to tick the 'impact' box, today's sustainability-oriented investors are concerned about the broader ESG picture, not simply the clean-energy label. Although much of the renewable energy manager landscape has been able to ride on the coat-tails of ESG-conscious investing in private markets, the 'E' is only one component of ESG.

As the ESG agenda matures and benchmarking improves, renewables managers will need to demonstrate their credentials beyond the 'E'. For example, bfinance has come across investors concerned with wildlife protection during the construction of assets, with the health and safety measures in place for workers at a biomass plant and even with the reputational effect of any dividends being channelled via offshore tax havens.

One interesting trend in renewables is a growing emphasis on the 'S': the social impact that can be delivered. This is particularly applicable for projects in emerging and frontier markets, where that new energy supply may be critical to supporting and developing the nation's economy.

DEATH OF A FIXED-INCOME PROXY

So, what does this all mean for investors? Clearly, the proliferation of renewables strategies in the market is a positive development. However, asset allocators will need to gain more comfort in merchant-project economics, as government incentives and subsidies are phased out. Even where subsidies persist, investors seeking higher returns will need to take on more construction, power price, counterparty, political or operational risks as yields continue to compress. The sector should no longer be approached as a 'fixed-income proxy'.

Yet this challenge also brings opportunities for those capable of navigating the less conservative end of the spectrum. ■

An emerging opportunity

Barry Lynch, partner and head of operations, energy and infrastructure at Actis, discusses the future of clean energy investment across Africa, Latin America and Asia

Q From an energy transition perspective, which geographies are most attractive right now?

Barry Lynch: We invest across most of Africa, Latin America, India and South-East Asia, although we have done less in South-East Asia recently because it has been harder to find opportunities of the right scale.

There are markets where the auction processes have stalled, for example in Mexico and South Africa, and that can be frustrating. But then India is particularly strong at the moment, in terms of regular auctions, and we are seeing South Africa really getting moving again. That is the nature of these markets. There will always be change.

Q What size and stage of investment do you tend to get involved in?

BL: We primarily invest in large-scale wind and solar projects, as well as gas-fired power generation assets. We have over 10,000MW of projects in operation and under construction at the moment in those technologies and across those markets. We don't really get involved at the smaller end. The smallest projects we look at are around 100MW and preferably larger than that.

We tend not to get involved in the earliest stages of greenfield development. We would rather come in from two years prior to financial close, when a power-purchase agreement is close to being signed. Our preference is to come in before financial close so that we can drive the final procurement and financing processes and then take the project through construction and into operation.

> "The days when we needed subsidies are long gone so it is more about governments creating a framework that is conducive to investment"

Q What are the particular challenges you face investing in these energy projects in emerging markets?

BL: There are challenges. It may well be that we are investing in a jurisdiction where the developer is working on the first large-scale wind farm that the country has ever seen. They will be doing the best job they can, but there may be issues that we can see, with our experience in other markets, that would otherwise get missed. For example, we always look very carefully at how land is sourced, what the lease arrangements are with landowners, and how the permits are sourced. These are things that may not be much of a concern in a European or US context, but which take on greater importance in a market where the first wave of projects is just coming through. If you are the first to be seeking environmental and planning approval for a large-scale wind farm, you certainly need to take an extra level of care to scrutinise how everything is being put together.

These may also be the first large-scale renewable projects going onto the grid. That takes a lot of extra technical work and interaction with the grid company to make sure everybody understands what's being built and how it is going to affect the grid in the region. Being first can certainly bring challenges.

Q What level of government support do you tend to receive, in terms of facilitating energy investment, in some of these emerging markets?

BL: Generally, governments are very supportive. We make sure we have strong

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engagement with them. The days when we needed subsidies are long gone, so it is more about governments creating a framework that is conducive to investment. That might mean a centralised procurement process with auctions, or it could be ensuring other government-related entities – be that the grid, or planning authorities – are putting the right amount of emphasis on getting these projects over the line.

Q How would you describe the competitive landscape for clean energy investments in emerging markets?

BL: We only see a handful of players operating across Latin America, Africa and Asia. What we do see is more and more niche players focusing on specific countries or regions. Some of those players are being very aggressive in terms of the power price they say they can deliver. We believe they can't possibly have considered all the factors, such as the ability to secure non-recourse long-term financing or some of the construction and operational challenges.

If you sign a PPA securing 90 percent of your energy sales, for example, that still leaves 10 percent coming onto the market on a merchant basis. Have they properly judged and priced how that is going to play out over the next 20 years? We believe that not everything has been adequately considered and they will learn from their mistakes.

Q How strong is underlying investor appetite for clean energy projects in emerging markets and what concerns do investors have?

BL: We try and break down the market and show investors that most electricity markets work in fundamentally the same way. When it comes to emerging markets, investors will be very concerned about ensuring the project has been put together correctly, through the development, financial and construction processes. You cannot argue that in less mature markets the standard should be lower.

> "You have to put a real emphasis on community engagement. We have a strong social investment plan. We support local schools, local businesses and local employment, creating that licence to operate"

They also worry about foreign-exchange exposure if they are US-dollar investors. Then there are always the overriding geopolitical factors – a change in government, for example. That can create some nervousness.

Some projects can be remote and that can bring security issues. You have to put a real emphasis on community engagement. We have a strong social investment plan. We support local schools, local businesses and local employment, creating that licence to operate. International investors look at that relationship and see that we are a good neighbour to the local community. Above all, investors are reassured that we are acutely focused on the very things that worry them.

Q What is your approach to mitigating FX risk?

BL: You can mitigate FX risk through the financing and construction phase with hedging arrangements. But if you are being paid for your energy in local currency over a 20-year period, you can't take that kind of hedge. We have to build that into our overall assumptions as US-dollar investors. We have comprehensive internal FX models in Actis that are used across our energy, infrastructure, real estate, private equity and fintech divisions, so we have a strong in-house view. We then build in those assumptions for the 20-year offtake period. It is about experience. It is not something you can hedge.

Q How hands-on are you as owners?

BL: Very hands-on. We work with our 12 power generation businesses on a daily and weekly basis, discussing their issues through the financing, construction and operations phases. We have got a lot of megawatts so we try to share the learning. For example, if we are building concrete towers with a particular wind turbine manufacturer in Brazil and we have just started using the exact same manufacturer in India, we will ensure those experiences are shared across the teams. We are a very active and heavily involved investor.

Q What is next for energy transition in emerging markets?

BL: The leaps that have been made in the technology – for both wind turbines and solar – in terms of scale, efficiency and pricing over the past few years have been remarkable. That is allowing us to deliver energy prices that five years ago we could never have hoped to deliver.

Now, we are watching grid and battery storage in Africa very closely. That has yet to have a huge impact on our larger scale projects, but I don't think Africa will have the grid network that we see in North America or Europe. I think that is the next big challenge and it will be exciting to see how it plays out. ■

PEI Alternative Insight

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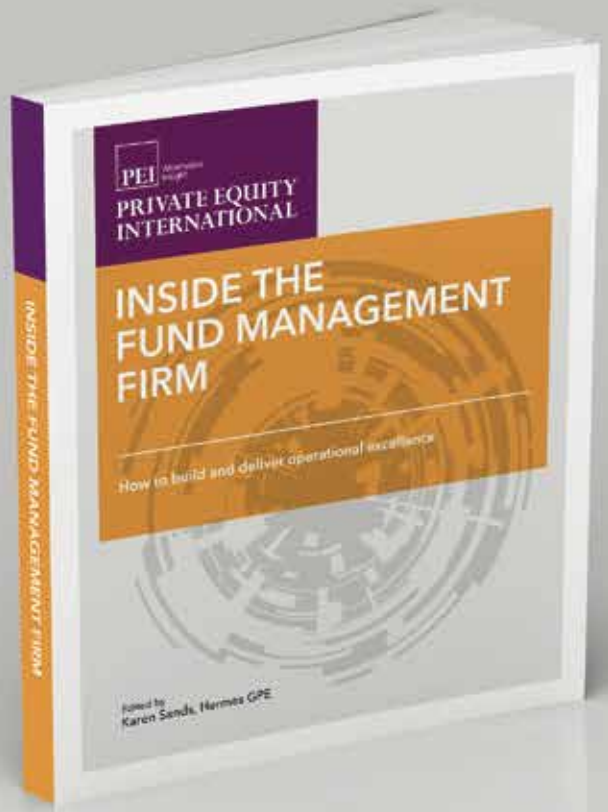
INSIDE THE FUND MANAGEMENT FIRM

How to build and deliver operational excellence



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Generation gain: energy produced from solar and wind power in Australia increased by 50 percent in 2018

Valuing Australian renewables

The country's renewables sector offers potential for above-average returns, but this high-growth story is not without risks. **Megan Raynal**, Australian infrastructure and renewables valuation specialist, reports

Australian renewable generation is growing rapidly and is supported by an abundance of natural resources, such as wind, sunlight and now, sadly, waste. There is, however, significant uncertainty related to energy pricing and energy regulation.

Energy prices are a key driver of renewable energy value. To understand pricing in Australia it is important to understand what is happening in the country's energy market.

Australia is experiencing significant increases in renewable energy supply, together with (primarily) age-based retirements of coal generators. While gas-powered generation is a key element of the energy mix, high gas prices and long-term international contracts have reduced the contribution of gas-powered generation. The rapid growth in intermittent renewable energy supply has put considerable pressure on existing distribution networks and led to increased caution by the Australian Energy Market Operator (AEMO) when connecting new renewable generators.

According to AEMO's Q4 December 2018 report, compared with Q4 2017, large-scale wind and solar generation in the National Energy Market (NEM) increased 50 percent, rooftop PV generation increased 25 percent and storage charging, or pumping load, increased 79 percent.

The fourth quarter of 2018 recorded the lowest quarterly average gas-powered generation on record. Gas-powered generation has declined steadily from Q4 2017, influenced by increased penetration of variable renewable energy, rising domestic and international gas prices, and comparatively high hydro output in 2018.

Although renewables have increased, there has been a reduction in coal-fired capacity. Capacity decreased by approxi-

mately 4,000MW between 2013 and 2017. The generators expected to retire by 2040 produce around 70,000GWh of energy each year, close to one-third of total NEM consumption.

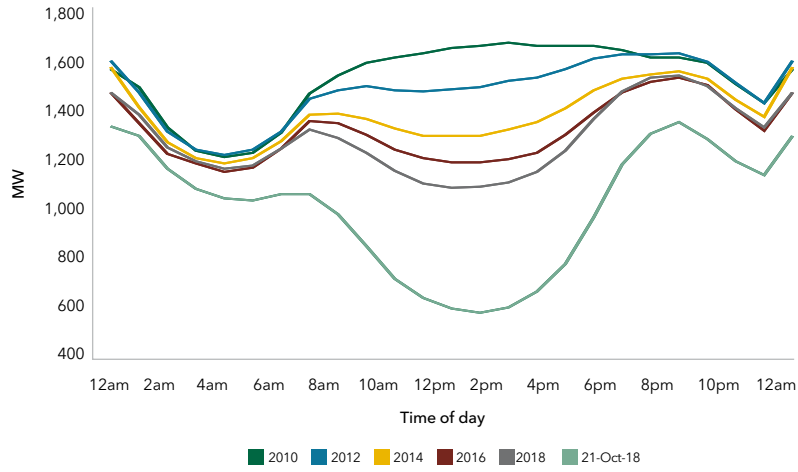
AEMO forecasts an energy mix with 46 percent renewable energy by 2030, and 78 percent by 2040, under a technology- and policy-neutral scenario. If more rigorous government-mandated technology and policies were applied, the fast-track scenario forecasts 60 percent renewables by 2030, and 90 percent by 2040.

According to AEMO, NEM average operational demand has been declining since 2009, influenced by the decline of energy-intensive industries, uptake of rooftop PV, and energy-efficiency improvements. As more solar comes online, demand increasingly reflects the 'duck curve', with peaking later in the day. This is demonstrated by the demand change over time in South Australia, which currently has the highest rooftop PV penetration. Prices at peak solar generation times can therefore be low.

Because of rooftop PV and distributed storage, AEMO expects that economic and population growth will no longer result in significant growth in the overall demand for power from the grid. AEMO does, however, expect increases in electric vehicles to have a moderate impact on demand.

AVERAGE OPERATIONAL DEMAND IN SOUTH AUSTRALIA, Q4

21 October 2018 saw an all-time record for minimum demand



Source: AEMO Insights, Quarterly Energy Dynamics, Q4 2018

VARIABLE ENERGY PRICES

A combination of factors has led to high black-energy prices in the short to medium term, together with high but declining green-energy prices.

According to the AEMO Q4 2018 report, quarterly average NEM spot electricity prices were A$82 ($58; €51) to A$96/MWh, which is the highest Q4 on record in all regions except Tasmania. These high electricity prices were notable because they occurred despite average mainland demand for the quarter falling to its lowest level since 2002 – and a lack of high spot prices above A$300/MWh. According to AEMO, a combination of factors has contributed to these electricity price outcomes:

- In the shorter-term, the reduction in output from gas powered generation has contributed to higher prices;
- In Q4, gas-powered generation set the price 25 percent of the time in the NEM compared with the long-term average of 15 percent;
- Other contributors include the structural shift of offers from black coal-fired generators to higher prices between 2014 and 2018, as well as the progressive closure of coal-fired capacity.

Calendar year 2019 swap prices are also looking robust.

Australia's Renewable Energy Target (RET) scheme creates a market for renewable energy generation certificates. The significant increase in renewable energy generation in 2018 contributed to a 34 percent decrease in spot large-scale generation certificate prices in Q4. The price of large-scale generation certificates traded around A$63/MWh in 2018. According to trading service Demand Manager, they are likely to trade at A$57/MWh in 2019, declining to A$28/MWh in 2020 and A$19/MWh in 2021, as more projects come online.

If the current government remains in power, it is expected that any shadow-carbon price will effectively fall to zero from 2020-30. This is because the current government has set an emissions-reduction target of 26-28 percent by 2030. With growth in renewables spurred by higher state-based targets, no further abatement will be required.

However, the opposition Labor party has set an emissions target of 45 percent. A federal election will be held in May 2019. If Labor wins, there may be more upside to the shadow-carbon price, although this is not certain.

NETWORK ISSUES

AEMO applies a Marginal Loss Factor (MLF) annually to generation for the purposes of calculating how much revenue a generator will receive for its electricity. A lower MLF means lower spot electricity revenue. Currently, AEMO sets MLFs one financial year in advance. The MLF is intended to encourage more generation in less power-congested areas and less generation in more power-congested areas.

Following the installation of several large solar farms in the northern Queens-

land region, the loss factors in the state as a whole have declined. This has come as a surprise to many of the investors as, historically, the MLFs have been reasonably stable.

As the Queensland example demonstrates, MLFs can change as supply changes and the annual setting of MLFs can make it difficult for investors to forecast revenue over a longer period.

CONNECTION CONCERNS

To manage the network system security, AEMO issues Directions (mandatory instructions to generators and network service providers for system security purposes). Directions may include curtailment instructions. Curtailment is a direction to stop generation to prevent the technical limits of the network being exceeded.

Curtailment in Australia has happened primarily in South Australia. Curtailments of wind generation in the state in Q4 2018 amounted to 4 percent of available generation for the quarter, down from 10 percent in Q3. While curtailment reduces revenues, it does so at times when prices are typically very low, thus moderating the impact.

At the Clean Energy Summit in Sydney in July 2018, an informal poll in a session hosted by Kane Thornton, chief executive of the Clean Energy Council, identified connection issues as the chief concern for more than 80 percent of those present.

Because so much renewable generation has been built recently and more is in the pipeline, connection requests have increased significantly. According to AEMO chief executive and managing director, Audrey Zibelman, where once AEMO might be dealing with 20 connection requests, it is now dealing with around 300, and many are looking to build in weak parts of the grid.

Zibelman says the system is now dealing with a new phenomenon, where solar projects could go from conception to construction in less than a year, but grid augmentations still take five to seven years. The current grid was designed to deliver power predominantly from coal-fired plants near three big mining areas. However, wind and solar farms generate intermittent power from more remote sites, where network capacity can be limited.

To keep the grid stable, equipment such as synchronous condensers or batteries may need to be added, which can increase costs significantly. In addition, AEMO often requires additional studies to measure the impact of the new generator on the grid. This can cause delays or unanticipated costs. To prevent unexpected costs and delays due to grid connection issues, it is important that developers engage with AEMO early.

REDUCING RISK

The Australian renewables industry is growing rapidly, and the energy landscape is changing. Above-average returns are achievable, but there are also risks that need to be managed.

Understanding the Australian energy landscape and future trends is critical. In our experience, a key value driver (and risk moderator) for Australian renewables is optionality/flexibility, which allows investors to take advantage of opportunities and mitigate risks.

For example, the Kiamal wind farm synchronous generator provides network stability, allowing the wind farm to scale up if demand grows.

For renewable investments with uncertain cashflows, it is important to understand and map out the potential cashflow impact of different scenarios. Cashflow scenarios should also aid in understanding what flexibility/optionality is available to mitigate risks and maximise opportunities.

Diversification is also important. The right diversification strategy increases value by more than the value of each asset in isolation. This is recognised by credit assessors too. In Fitch's Renewable Energy Project Rating Criteria paper, published in February 2018, the agency noted that "for a well-diversified set of wind projects, the portfolio effect may result in an increase in the aggregate P90 estimate by 2-5 percent, compared to the sum of the P90s of single projects".

Using a portfolio approach can therefore maximise risk-adjusted returns.

In conclusion, Australian renewables are in growth mode. For renewable-energy investors, it is important to understand the potential range of outcomes and how risk and opportunity can be managed along the way. ■

Waste not want

It is worth mentioning developments in waste-to-energy in Australia, as there is currently significant interest in this form of generation. Australia's first large-scale waste-to-energy plant is under construction in Western Australia and others are being planned.

Following China's decision not to import waste, Australia is looking for solutions to manage waste, with most states considering some form of waste-to-energy strategy.

Waste-to-energy plants have the potential to provide strong returns because they should be able to obtain reasonably cheap (or free) waste input and generate power at times when prices are high. However, waste-to-energy plants typically deal with councils and large waste operators, and the development model is still immature. Input quality and input costs remain a significant challenge, as do project technicalities, environmental control requirements and local community perceptions.

Stamp duty is also a consideration for waste-to-energy (and pumped hydro) assets in Australia, as these are considered fixed to land (and therefore liable for stamp duty), unlike wind and solar.

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Re-architecting society for a low-carbon world

AVAIO Capital founder Mark McComiskey on the opportunities arising from the energy transition, from energy as a service to distributed generation

Q What needs to happen for us to transition to a low-carbon economy?

Mark McComiskey: Virtually everything about society will need to be re-architected. For example, according to UN forecasts, roughly 2 billion people, 25 percent of the global population, will move into cities over the next 20 years. That creates an enormous opportunity to do things differently: to design those cities to have a zero-energy footprint, to maximise water reuse and minimise commuting and waste. Some cities in the US are taking this approach with neighbourhood redevelopment plans. This is driving the creation of new district heating and cooling systems, for example, and distributed generation, micro-grids and energy storage. As a build-to-core-focused investor, we are seeing enormous opportunity in the creation of new infrastructure need to facilitate the shift to a low-carbon society.

The easiest way to reduce the carbon footprint is to use less energy. Large companies can afford to analyse their facilities and implement the newest energy-efficiency technology. Small firms sometimes lack the resources to devote to understanding the options available for reducing consumption and creating opportunities for third parties to provide energy savings equipment under long-term contracts.

Q What about renewable energy itself?

MM: Renewables are exciting in terms of their impact on society. But it has become such a hyper-efficient market in terms of procurement and financing that it has become difficult for traditional private equity or infrastructure funds to invest in that space.

> "There is a lot of low-hanging fruit in the US, in terms of driving energy efficiency. There is no real technology risk and the returns are very attractive"

The manufacturing costs of solar, for example, have dropped to the point where it is common for long-term offtake contracts to be below the spot market price of electricity. Mid-to-high single-digit returns have become the norm. And that is perfectly appropriate for certain types of investment mandates. But the returns are lower than you would expect to find in the traditional fund investment mandate.

Q You mentioned distributed generation and energy storage. What opportunities are being created by the rise of renewables there?

MM: Certain types of renewables, like solar, lend themselves to a distributed approach – on residential and commercial rooftops, for example. That is necessitating a restructuring of both industrialised and industrialising countries' approaches to electricity transmission and distribution. In the developing world, there are opportunities to architect electrical systems based around locally sited clean power, with local micro grids and energy storage. With these sorts of projects there is much less emphasis on large centralised power plants and long-distance transmission.

Renewables also involve a degree of volatility. They produce electricity not on

demand, but when the sun is shining or the wind is blowing.

When they do generate, their marginal cost is low and they are displacing traditional thermal-base load-power plants. But when the renewables aren't generating, the system needs the ability to pick up the slack. That is creating a need for increasing amounts of both energy storage and peaking generation to ensure adequate electricity supplies and grid resiliency.

Utility business models are also being challenged. At a high level, most electric grid operators today recover their costs by charging customers based on the amount of electricity consumed. Many customers are now producing their own electricity or adding storage, displacing their payments for those grids. This has created investment opportunities for the fleet-of-foot, but will also force an evolution in the traditional utility business model.

Q What types of deals are you targeting within these sectors?

MM: We have a build-to-core strategy. We will bring something new into existence but, once it is in existence, it will need to have the characteristics of core infrastructure: long-term cashflows supported through contracts or protected positions. You won't see us building merchant power plants, for example.

So, where are we looking? Areas like energy storage, which is a hot topic right now. There are lots of different approaches – PPAs, revenue-sharing models, compensation for cost avoidance. It's an interesting space because the cost of batteries is dropping steadily, and this is leading to a gradual increase in investment opportunities. It seems clear this market will grow.

Energy conservation is another area where we can implement the build-to-core strategy. In 1990, the US consumed about twice as much power per household as Germany. By 2018, the figure has risen to almost three times as much. What that means is that there is a lot of low-hanging fruit in the US, in terms of driving energy efficiency. There is no real technology risk and the returns available are attractive.

Q You primarily focus on the US, but you invest opportunistically in Europe. Are there other key differences between the two geographies?

MM: Generally speaking, the European market is further along in the psychological and regulatory shifts needed to drive the transition to a low-carbon world. You find a higher degree of regulatory support – not driven by tax structures, as in the US, but by some form of offtake or outright mandates, such as packaging waste regulations.

However, as the economies of scale for renewables, energy efficiency and energy storage have continued to grow, these are all increasingly becoming bankable investments in their own right, independent of incentive structures. Consequently, we see many of the same approaches being implemented in the US, Canada and the UK, for example. Improving cost curves are driving a degree of convergence.

Q What are the biggest challenges you face?

MM: Unless you are careful, you can find yourself exposed to changing government regulations. We didn't participate in any UK battery storage investments, but it was a sector we looked at. That market was driven by a system of incentives that allowed customers to save on their overall electricity bill by using batteries to reduce consumption during a few peak hours. The returns were so attractive that there was a rush to deploy batteries, creating a challenge for the pricing mechanism for electricity in the UK. Not only that, but the whole system was declared illegal by the European courts and the complications are still being worked out.

Governments should focus on ensuring their incentivisation programmes are sustainable, and we as investors need to consider carefully the potential vulnerability of a project to changing government policy. Offtake contracts with creditworthy counterparties are very important.

Another challenge is identifying scalable opportunities. As increasingly large funds compete for the small number of big trophy assets, our focus is on the middle market. It takes a lot of work to find companies and assets that are accomplished and differentiated in their niches. But when we do so, they often have a viable pipeline of opportunities to reach critical mass. We spend a lot of our time working to build scale in such platforms.

Q Where does the future of the energy transition lie?

MM: The roadmap for the next five to 10 years is well established: a continually increasing focus on efficiency and minimising energy usage, deeper penetration of renewables and energy storage as their costs continue to decline, and a gradual but accelerating transition away from oil for transportation.

Increasingly stringent regulations around the energy footprint of buildings, combined with more stringent building codes, will require the re-architecting of neighbourhoods. More progressive places like San Francisco are leading the way, but we expect that to continue to spread as the cost of implementation comes down. It is the same virtuous circle we saw in solar power seven years ago and in wind energy before that.

Carbon-based powerplants will become more challenged economically as coal and gas are displaced by renewables. And the grids themselves will need to change in response to those dynamics, with batteries or quick-start pikers being implemented in ways and places we haven't seen before.

We will also see the impact of electric cars, ride-sharing and – in the longer term – automated vehicles. That will create opportunities for investors, but challenges too. ■

Roundtable

PHOTOGRAPHY: MICHA THEINER

From left: Jeroen Wolfs, Dan Wells, Kai Rintala, Shreya Malik

Living in a merchant-power world

As renewables projects ditch subsidies, four industry participants tell Zak Bentley why they prefer market risk. But all acknowledge they will need to work harder than ever, not least to convince investors they are well-equipped to handle the sector's changing risk profile

The day before we gather at Foresight Group's offices in London's Shard tower for our energy transition roundtable, the UK government announces its 'Offshore Wind Sector Deal'. Under the initiative, a third of the country's electricity is to be powered by offshore wind by 2030.

The announcement is significant, especially considering that 623 days earlier a different UK government of the same political persuasion had issued an ultimatum to the sector, insisting that "offshore wind is still too expensive" and that it "needs to move quickly to cost-competitiveness".

The contrast is emblematic of the growth in renewables, not just in the UK but across the world. Yet our roundtable also takes place shortly after the offshore wind debacle in Taiwan, where the messages sent out by the Taiwanese government to some of the world's largest renewable investors were, to put it euphemistically, rather mixed.

It was a reminder of some of the political and regulatory risks that used to be posed by renewable energy subsidies. These are risks that the participants at our roundtable – Foresight Group's Dan Wells, Shreya Malik of Partners Group, Taaleri Energia's

Kai Rintala and Jeroen Wolfs from Aquila Capital – have largely left behind as they increasingly operate in a subsidy-free era of merchant power. Against this backdrop, the first key question for them is as follows: are we living in a riskier or a safer world when it comes to investing in renewables?

"We can't just acquire homogeneous assets that have simple feed-in tariff structures anymore," says Wells. "We have to be active and get involved in putting together corporate power-purchase agreements, for example, to underpin the projects in question. From a portfolio standpoint, in some ways, it can be quite helpful in that we can just price assets based on the underlying credit of the corporate offtaker, as opposed to having to make calls on various kinds of regulatory or sovereign risks. Certainly, the supply of corporate PPAs is a key limiting factor."

Wolfs also believes much of the industry is now at a less risky standpoint.

"Moving from subsidised to unsubsidised means swapping regulatory risk for market risk, with those assets basically being able to survive on their own," he says. "So you could argue these assets are actually less risky. There's a lot of education involved [for certain investors], but it does deliver opportunities for asset managers like ourselves."

AROUND THE TABLE

Jeroen Wolfs, co-head, Energy Transition Infrastructure Fund, Aquila Capital
Wolfs joined Aquila's Amsterdam office last September after nearly nine years at Dutch pension fund PGGM. He previously spent four years as an analyst at advisory firm Grontmij Capital Consultants, later acquired by consultancy and engineering group Sweco.

Dan Wells, partner, Foresight Group
Wells joined Foresight in 2012 and is based in its London office, where he is responsible for the firm's existing retail solar funds as well as deploying its energy infrastructure strategy more widely. Wells, who has 18 years of experience under his belt, was a managing director in Sindicatum's corporate finance division.

Shreya Malik, vice-president, private infrastructure Europe, Partners Group
Malik, who is based in London, has been with Partners Group since 2011 and has 11 years of experience. She previously worked at Oxera Consulting and had assignments at Oxford University, Standard Chartered and Principal Group.

Kai Rintala, managing director, Taaleri Energia
Rintala joined the Helsinki-listed energy infrastructure developer in 2016 after nearly 11 years with KPMG. He has worked with the firm both in Helsinki and in London, advising public and private sector clients on strategy and transactions across energy, transport and social infrastructure.

PROTECTIVE MEASURES

Rintala agrees with Wolfs and adds that, coming from a liquid Finnish market, there are several ways in which managers can protect themselves.

"We are effectively swapping regulatory risk for counterparty risk, which we believe is a positive development in many markets," he says. "In order to protect our investors and stay true to our infrastructure heritage, we need to ensure that the majority of our revenues are properly contracted. And to do that, we need to consider and understand the creditworthiness and associated risks of the offtaker, PPA provider or financial hedge that we put in place as we structure our investments."

Europe has struggled to keep pace with the progress made by North America on corporate PPAs. However, Malik says work is taking place to bring a more standardised formula to the market and thereby ensure that projects are less risky.

"We see a bigger role for the banks, the supply chain providers and governments on a structure that would work," he says. "More and more PPAs will substitute the classic subsidy-based feed-in tariffs.

"Nevertheless, the question is: how deep will the PPA market be? We see the link between bank financing and PPAs or feed-in tariffs softening further, and investors that can assess merchant risk are expected to gain market share. The market is adapting quite quickly and we could see an evolution in available structures that would offer a different risk-return proposition. This can already be seen in several parts of Europe. It's probably on a smaller scale [than in North America], but it's something that's coming into force."

The flipside of finding strategies to adapt to the subsidy-free, merchant-power world is whether this is what investors even imagine renewables to be when they commit the capital. A survey released in February from Octopus Group showed a significant majority of investors still wanted wind and solar sites to benefit from government support, amid concerns about energy prices. The survey's respondents also demonstrated a preference for UK-based assets. Are their expectations where the market is at?

"A lot of investors probably need to

> The energy transition is twofold. On the supply side, renewable energy is substituting fossil fuel, while on the demand side, there is a need to be more efficient and more flexible" **Malik**

adapt to the new reality of an uncertain, unsubsidised world in combination with very cost-competitive proven technologies," says Wolfs. "It's not necessarily a mismatch in expectations, but I think it's a continuous education for the investor community about the way these projects work nowadays. It's just a different kind of risk-return profile."

The situation does, however, require more work from the managers.

"What investors want from us isn't to take more risk as managers, but to seek out good risk-adjusted return," says Wells. "You have to think of the whole energy and infrastructure system together, which is increasingly interdependent. You can't just invest in solar if you don't understand what's happening in electric vehicles, for example. These are the kinds of things we have long investment committee discussions about."

Meeting investors' return expectations also relies on making the most of asset management.

"I don't think we see ourselves taking more risks than we used to," says Malik. 'We are pursuing a building core strategy in the renewables space and aim to work together with key stakeholders including suppliers, offtakers and lenders on new project structures as we adapt to a rapidly evolving market."

TERRA INCOGNITA?

Alternatively, the solution may lie in heading to pastures new, despite investors' preferences for more established markets.

"Our strategy is to stick with the proven technologies in onshore wind and solar," says Rintala, "but to leverage our in-house development and engineering strength to operate in geographies where there is perhaps less competition.

"Poland, where we're currently looking at deals together with partners, is a good example of where we can add more value with our technical team. Our other focus markets are the Nordics and Baltics, Spain and Portugal, and Texas, where we have a development team based in Dallas."

Despite a chequered history in recent years between Poland's incumbent government and renewables investors, Taaleri is not the only company attracted by the country's natural resources.

"We are also assessing new markets like Poland and other Eastern European countries, where the fundamentals make sense," says Wolfs, though Aquila is yet to make an investment in eastern Europe. "We typically invest in Europe where the resources are rich, such as the Nordics and Iberia."

Malik's Partners Group, however, is used to scouring the globe for relative value as part of its strategy. "For renewables, the first-mover advantage is important," she says. "We invested in a big solar platform in Japan a few years back. We have also been one of the first investors in European offshore and we are also active in Taiwan and Australia, which is currently the market where we see a lot of interesting and attractive opportunities."

Taiwan's recent offshore wind experience has made the firm wary though.

"We often see that there is a learning

"A lot of investors probably need to adapt to the new reality of an uncertain, unsubsidised world in combination with very cost-competitive proven technologies" **Wolfs**

curve when jurisdictions open up to new sectors of investments," says Malik.

Foresight is also exploring more opportunities in Australia and the US, albeit beyond the traditional renewables sectors.

"We started investing in battery storage in the UK and we see value opportunities on the flexibility side in Australia over the next one to two years," says Wells. Foresight is eyeing opportunities in the US, where, says Wells, "the regulatory environment is evolving quite quickly to become more favourable for things like battery storage".

It is also looking at certain European markets, such as Germany. "The learning we're amassing about investing in batteries and managing combined solar and battery portfolios will have application in emerging markets such as India in the not-too-distant future," he says.

Wells' enthusiasm for storage is a reminder that he was one of the few enthusiasts for its investment potential at last year's roundtable. So how do this year's panel members feel about the subject?

"It all depends on what kind of revenue stream and regulatory framework is underpinning it," says Wolfs, whose company owns one solar-storage asset (in Japan). "In Europe, there currently aren't many jurisdictions which have that [combination]. The UK used to, but now there is uncertainty."

Malik says that, as many standalone opportunities are not always investable from an infrastructure perspective, Partners Group is mainly assessing co-location sites with wind or solar where it makes the most economic sense.

"The market is waiting for the emergence of large-scale batteries that can cover hours and days," she says. "We don't think that will happen too far into the future, but until then, it's going to be quite opportunistic and case-specific."

For Rintala, storage is something for the future rather than the present. "We ask if storage capacity would actually help the performance of our existing

"Our strategy is to stick with the proven technologies in onshore wind and solar, but to leverage our in-house development and engineering strength to operate in geographies where there is perhaps less competition" **Rintala**

portfolio," he says. "This does not work commercially today. Whether it works in a year, or two years, or three years, that's the debate, and we will keep an eye on it. As it stands, we would only go into storage as an add-on investment that would provide additional returns to an existing portfolio investment."

BATTERY POWER

Perhaps unsurprisingly, it falls to Wells to pick up the baton for storage.

"We would say that batteries can offer attractive returns as a form of 'short-duration' infrastructure asset," he says. "But there are risks that need to be carefully managed. It's not so much about the technology. We don't take any technology risk with batteries. Like any infrastructure asset, it's the contract that underpins it.

"And it's not so much about the battery in isolation, it's about understanding the system. Batteries are mostly still providing frequency-type services to the grid. There could be a much bigger application for batteries if they were to start to move from more niche ancillary services to providing meaningful amounts of multi-hour backup power.

"We're seeing in the US a real kind of progress in that regard. We would emphasise that you need to be very careful to analyse the contractual framework and how the assets fit within a suitably diversified portfolio when you're investing in batteries."

Although Wells says Foresight is looking at a range of assets in terms of generation, transmission and distribution, it is not currently looking at electric vehicle charging infrastructure. Credit ratings agency Standard and Poor's in March derided the asset class as "unprofitable and therefore unproven", and Wells has similar concerns.

"It's something we're watching closely and there is a lot interest and activity," he says. "But we haven't really found models to date that are particularly compelling from a profitability standpoint."

> You have to think of the whole energy and infrastructure system together, which is increasingly interdependent. You can't just invest in solar if you don't understand what's happening in electric vehicles" **Wells**

There have also been concerns about whether grids can keep up with the wealth of renewables projects entering the system, as well as other energy-intensive infrastructure assets, such as data centres. Malik believes Partners Group's purchase last year, in a consortium with CDPQ and Ontario Teachers' Pension Plan, of energy-services provider Techem at an enterprise value of €4.6 billion, could offer a solution.

SUPPLY AND DEMAND

"The energy transition is twofold," she says. "On the supply side, renewable energy is substituting fossil fuel, while on the demand side, there is a need to be more efficient and more flexible. Techem is one of the larger players in the market and well-positioned to play a role in the energy transition in Germany and across Europe.

"Energy transition is definitely a key focus area for us and, with the pace at which the renewable energy build-out is occurring, it's becoming more and more important."

Wells believes storage can also play a role in this balancing act: "Storage can be used as a transmission asset by providing 'congestion relief' in bottleneck areas, particularly those close to renewable-power assets. It can therefore be a really effective way of incorporating high levels of wind and solar without having to build massive new transmission lines."

It is clear that the path to a cleaner and greener future still needs to be navigated. There remain substantial differences between the renewables industry and investors, between the industry and government, and between the industry and technology firms.

However, no one around the table disputes that there will be ample investment opportunities in bridging those gaps. As the market becomes more complex, the participants in our roundtable believe that organisations like theirs are best placed to do so. ■

The Mexican opportunity

InfraRed Capital Partners' Stéphane Kofman and Daniel Sausmikat discuss what recent energy reform and plenty of sun mean for renewable investments in Mexico

Q What makes Mexico an attractive market for energy transition investments?

Stéphane Kofman: First and foremost, Mexico has implemented comprehensive legislative reform of the energy sector. A key pillar of this new framework is promoting the involvement of the private sector as a key contributor to the transformation.

Of course, operating within the right regulation framework is important, but we also carried out a comprehensive assessment of the market. Through this exercise we ascertained the existence of strong and sustainable underlying fundamentals such as demand for energy. Demand has increased significantly and is forecast to continue to do so, on the back of population growth, industrial expansion and overall GDP growth. Mexico has also established ambitious clean-energy targets of 35 percent by 2024 and up to 50 percent by 2050.

All of the above factors, combined with attractive power prices, are supporting significant requirements for new power generation capacity, particularly in renewable energy.

Q Why Mexico rather than any of the other Latin American countries displaying similar market fundamentals?

Daniel Sausmikat: It's true that a lot of those fundamentals – strong demand, available land and good resources – are also applicable to other Latin American countries, but there are several key factors in favour of Mexico.

Firstly, there is Mexico's extensive track record of foreign direct investment, its prolificacy in entering investment treaties and its membership of the OECD. For us, as an investor that has traditionally operated in more developed countries, going into a new market that features not only a strong track record of being open to international investors but which also benefits from a strong business framework was very helpful.

> "The emphasis on getting involved in projects at an early stage of the value creation is in our DNA. We like to be in control of our destiny" **Kofman**

Secondly, Mexico offers significant scale compared with other Latin American countries. It has the second-largest economy and population in the region. So any market segment opening for new investments, such as the energy sector, is likely to yield a larger number and more sizable opportunities than in most of the other countries in the region.

Q Is solar the primary focus in terms of energy transition in Mexico, or are you also looking at other opportunities?

SK: We have developed a large portfolio of solar PV assets, but Mexico also has a need for a big modernisation of its existing gas fleet. We are tracking that sector closely and have already successfully invested in one of the largest high-efficiency gas facilities in the country. This new CCGT plant is currently under construction and is progressing well.

Q What stage of investment do you focus on in Mexico and why?

SK: For now, we are focusing on a value-add strategy. That means we are deploying capital targeting higher returns for higher risk on a relative basis.

This value-add strategy can either require our involvement at the development stage, participating right from the start or us acquiring assets at a more advanced stage of development.

This emphasis on getting involved in projects at an early stage of the value creation is in our DNA. It's what we have done in many markets over the past 20 years for our value-add funds. We like to be in control of our destiny.

That said, we are also tracking what's happening to projects which are already operational and generating energy in Mexico, and there may be an opportunity for us to consider those sorts of deals in the future.

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Q What is your approach to origination and is it different in a market like Mexico?

SK: There are some differences, yes. It was very important to identify a solid and reputable local investment partner to originate and develop the assets alongside us. Having a JV with a local partner accelerated our penetration in the market. It was a way to open doors and screen a larger volume of opportunities.

In addition to working with a JV partner, we have been leveraging our global network to see how we can capitalise on our existing relationships in a market like Mexico. Finally, we also decided to dedicate our own origination resources, as we had identified Mexico as a key strategic market that deserved our time and effort in terms of systematic screening of potential investment opportunities.

Having done all that, we decided to stay away from the PPA auctions granting a 15-year power offtake contract with the state-owned utility: the former public monopoly, Comisión Federal de Electricidad. We instead focused our direct origination efforts on contracting and commercialising power to the private sector, principally large commercial and industrial energy consumers.

DS: We undertake the commercialisation effort through a separate distribution entity, which we have set up jointly with our local investment partner. In doing so, we are creating a 'route to market' for the power generated by our projects. After a relatively slow start, we gained traction with industrial clients and have been able to successfully contract most of the power generated by our projects with large industrial and commercial consumers.

Q What are the risks associated with investing in Mexico and how are you mitigating them?

SK: The renewables market in Mexico is still relatively immature. Many of the players – the trade operators, the regulatory authorities, the wholesale power market – and the related processes are still in their infancy. It was important for us to invest enough time and resources in working with public and private counterparties, ensuring we establish strong relationships and share similar ambitions so that we can jointly facilitate the implementation of the ambitious macro policy.

> "Going into a new market that features a strong track record of being open to international investors was very helpful"
> **Sausmikat**

Logistics has at times also been an interesting challenge: for instance, the ports, the warehouse facilities and transport networks needed to accommodate considerable and unusual volumes of imported goods and distribute the equipment efficiently. In practice we have been pioneering logistics complexities for large-scale projects in the region.

DS: At times, it can also be challenging to find the right construction contractors or subcontractors and to find a reliable local supply of some specialist equipment. These are the challenges you would expect from operating in a nascent market with a relatively limited track record of projects of this type.

SK: Another very important consideration for our business, I would add, is the security of people and how we make sure we can enforce a strict health-and-safety policy in our projects. We spend a lot of time monitoring these risks and sharing best practice.

Q Mexico has a new government, and the latest round of renewables PPA auctions have been postponed. Are there any concerns there?

SK: It is not affecting our business directly because, as mentioned above, we have developed a strategy for power commercialisation outside of the PPA auction process. But we are certainly watching these developments closely to ensure there has not been any change of heart in terms of supporting the continued deployment of new renewable energy projects. So far, we have not seen anything alarming.

DS: I would agree. There is a long history of foreign direct investment, private sector participation and overall pro-business policy and legislation in Mexico. Even though the new government is promoting a path of change, we do not think this is likely to result in a major change of the current plan for the power sector.

Q What does the future hold for the energy transition market in Mexico?

SK: The energy sector in Mexico will most likely face the same challenges as the ones we have seen in other global markets where limited transmission and distribution capacity eventually become a constraining factor for the deployment of new generation projects. We are well prepared for this situation on the back of what we have already been developing in Europe and the US. We are indeed actively supporting flexible generation and battery storage investments to facilitate the continued growth of renewable energy assets. ■

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Big brands: Coca-Cola Amatil is among the corporates buying wind power in Australia

PPAs are exploding. But are they safe?

In 2018, the volume of corporate PPAs more than doubled compared with 2017. With strong demand and many investors chasing the same buyers, Daniel Kemp looks at the risks involved for all parties

Last year, the corporate power-purchase agreement really came of age. Data published by Bloomberg New Energy Finance show that 121 corporations in 21 countries signed PPAs in 2018, accounting for 13.4GW of clean energy. The figure for 2017 was just 6.1GW – less than half the figure for the year before.

The number of PPAs being signed has been rising steadily for years, but this was an unprecedented leap and a sign that demand has taken off in a big way. More than 60 percent of this activity occurred in the US, with some 34 new companies signing PPAs for the first time. This particular trend is being replicated around the globe, as corporations with little-to-no experience of buying their energy from anywhere other than traditional retailers enter the market.

Signing PPAs suits buyers, who get to burnish their green credentials, reduce their exposure to energy price volatility and lock in lower prices. It also suits sellers, who are able to secure a reliable long-term revenue stream for their generation asset at a fixed price. Yet there are risks involved.

Standardisation is improving, but the lack of it to date has put some corporations off. The credit risk for investors associated with contracting directly with purchasers is also real, especially when dealing with a buying group.

PPAs are obviously highly attractive to infrastructure investors focusing on renewable energy assets. However, it is vital for these investors to be aware of all the complexities that such agreements bring.

FIRMING UP

The factors underpinning the rapid growth in PPAs are simple: companies want to secure lower-cost energy for long periods; and if that can come from renewable sources to help meet emissions reduction targets, so much the better.

"All of the large energy users are having a good look at how they manage forward risk on energy price volatility and how they manage meeting their sustainability objectives," says Andrew Tipping, general manager, clients and business development, at Sydney-based consultancy Energetics. "Those two drivers have come together quite nicely in the last couple of years, which is why you're seeing a lot of transactions.

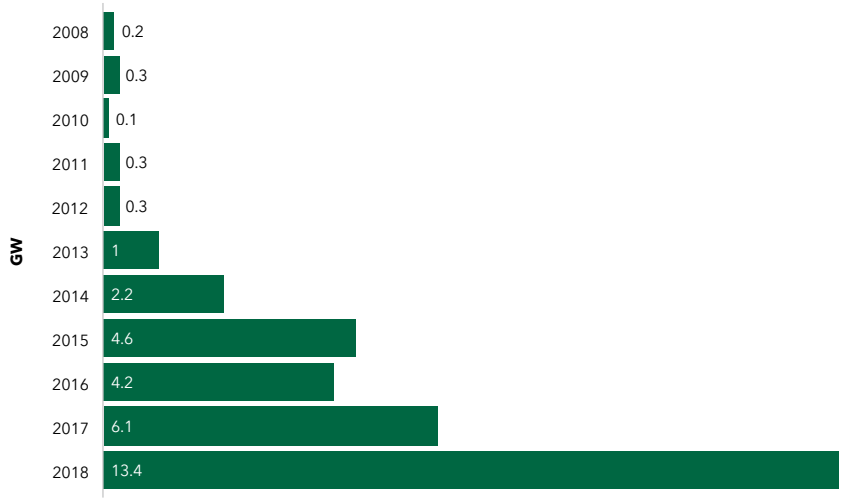
"There has always been a sustainability driver [for PPAs], but not much happened until the costs came into alignment with what people are willing to pay. The rubber doesn't hit the road until the CFO says 'yes'."

In Energetics' home market, this has been especially pertinent. Rising energy prices in Australia have been partly fuelled by a lack of certainty around federal energy policy and the closure of fossil-fuel generation. This in turn has made lower-cost PPAs more attractive.

Ivan Varughese, Macquarie Capital's

BIG BANG

Last year saw corporate PPAs truly take off, more than doubling the capacity signed in 2017



Source: Bloomberg New Energy Finance

head of infrastructure, utilities and renewables for Australia and New Zealand, says that a deal signed recently for one of his assets had resulted in significant cost savings for the buyer: "We've seen examples where the end cost to the consumer was 20-30 percent lower than what they were getting from their existing contract with a retailer. The savings we are seeing are material and that will continue to drive this."

In other regions where the difference might not be so stark, such as the UK and the Nordic countries, hedging against volatility has proved a good reason to sign PPAs.

"There is a side that is driven very much by sustainability and green targets," says Natasha Luther-Jones, partner and global co-chair of energy and natural resources at law firm DLA Piper. "But then you've got the industrial players, particularly in the Nordic market, who are doing it for price certainty and security in a long-term hedge for their costs."

NO STANDARDISATION

This explosion in the number of deals has not come without problems. One of the main challenges is that, with the market still relatively immature, each PPA is different and there is little standardisation in contracts.

Luther-Jones says that while this might be expected in a less mature market, such as Australia's, it is also true of Europe, where PPAs are more established. Her team at DLA Piper is currently working with the European Federation of Energy Traders to develop pro-forma contracts, but it is a process that is taking some time.

"No two deals are the same and there has been a lot of criticism about how different they all are," she says. "There's just such a variety around what you can do with PPAs at the moment, whether physical or synthetic or a hybrid."

Tipping echoes this, saying that one recent transaction in which Energetics was involved took several years because it had to start with a "blank piece of paper".

"The market's evolving very rapidly, and it may not standardise until that evolution slows down a little bit," he adds. "Things can definitely improve more, but I think they already have."

Matt Hammond, partner at Foresight Group, says the need to educate corporate counterparties is a "material limitation" to the current PPA market. "As more deals are done and contracts and products become increasingly standardised, corporate PPAs are likely to scale significantly," he says. "Experience and standardisation will likely allow corporates and generators to better understand each other's requirements. This process is more advanced in Europe and the benefits are starting to be seen."

A BUYER'S MARKET

With all these new entrants to the market, and a lack of experience on the corporate side, are all the risks being properly considered?

"The corporates have got to better understand market volatility because essentially they were shielded from that by the retailers before," Tipping says. "And on the developer/investor side, they've got complexity in understanding how to navigate corporate buying behaviour."

Assessing corporates' behaviour is a key consideration. To take Australia as an example again, Business Renewables Centre Australia in March launched an online marketplace to connect renewable energy projects with corporate buyers.

Upon its launch, the platform had 7,000MW of projects seeking buyers potentially looking for PPAs. Figures published by the Clean Energy Council, Australia's industry body for clean energy, in November 2018 showed that 14.6GW of new renewable energy generation projects were under construction, with more in the pipeline.

Not all of that pipeline will necessarily be built and not all of it will require PPAs to be financially viable, but a significant proportion of it likely will. Although it is clear that energy consumption generally is on an upward trend, views differ on whether that will translate into enough demand for PPAs to ensure that all of these renewables projects are viable.

Tipping says Australia has a "very high volume of transactions relative to our

market size. So the importance of the corporate PPA market to renewables is higher than in other markets. There are probably more projects than there is demand. A lot of the early corporate movers have already moved and executed a PPA contract for the proportion of the load they want."

However, Macquarie Capital's Varughese believes there is enough demand to satisfy the project pipeline. He points out that a range of companies – including toll road operator Transurban, supermarket chain Woolworths and Amazon – are all currently tendering for renewable power in the Australian market.

"Notwithstanding the policy uncertainty that we've had in Australia, industry and businesses are actually getting on with it and they have decided that this is what is needed," he says. "There's no doubt that a pro-renewable policy environment would help, but even as we sit here today deals are still getting done."

For now, though, many renewables schemes are chasing the same pool of potential buyers for PPAs. This could lead to less savvy developers and energy buyers taking on unexpected risks.

"Some developers don't really know what's best to offer," says Luther-Jones. "This is because other developers are also chasing the same corporate deals, meaning the corporate can dictate what they want."

The problem with this comes back to the fact that the corporates themselves are often inexperienced in energy buying and do not properly understand what they want or how to best to manage risk.

NOTHING IS SACRED

There is another intriguing possibility to consider with these deals, which is what happens if energy prices drop significantly below whatever the PPA price has been set at.

"The bottom line is that this is still a developing market," says Jeffrey Altman, senior advisor at Finadvice. "People believe in the sanctity of PPAs and think they have a locked-in price for the full term of the agreement. But there are instances that allow or require these agreements to be renegotiated. Most PPAs can't be broken, but they can be renegotiated."

In a simplified example, he hypothesises a macro-level event whereby a government would be unlikely to stand idly by if power prices fell in a given country or region to the point where a critical industry might be on the receiving end of a particularly bad deal.

"Investors understand the credit risk associated with PPAs," he says. "But I suspect they don't fully understand the nuances of what can change and the impact that might have on their entire portfolio."

It is not necessarily a likely scenario, or even one entertained by many of the investors we spoke to. But with increasingly populist governments popping up in many countries, and showing a willingness to intervene in private markets, it is a risk worth considering.

Yet in spite of the complexities surrounding PPAs, this is a trend that does not appear to be going away any time soon. The fundamentals driving the growth in PPAs – rising or increasingly volatile energy costs, coupled with a need to lower emissions – will not change and make the agreements attractive for buyers. The need to secure long-term revenues makes them equally attractive for investors.

"PPAs are not the only answer to a non-subsidy environment, but they'll always be part of the solution," Luther-Jones says. "Certain regions may slow down as the corporates reach capacity, but PPAs are here to stay." ■

> "No two deals are the same and there has been a lot of criticism about how different they all are"
> **Luther-Jones**

Buying groups

Buying groups, where parties pool their purchasing power to amass a sufficiently high volume to justify a PPA, have proved a particularly complex area as PPA contracts develop.

A recent example of this is the one in place at Partners Group's Murra Warra Wind Farm in Australia, where Telstra, Coca-Cola Amatil, ANZ Banking Group, the University of Melbourne and Monash University agreed to purchase a significant portion of the project's output.

Macquarie Capital developed the Murra Warra project. Ivan Varughese, the firm's head of infrastructure, utilities and renewables for Australia and New Zealand, explains that Australian telecoms company Telstra helped get around some of the complexity by aggregating the load by itself and sourcing other partners to get the deal to the relevant scale. However, he says the firm still had to assess the credit risk for each of the counterparties involved, and not just Telstra.

Matt Hammond, partner at Foresight Group, says: "A project that relies on a corporate PPA faces credit risk against that entity. Investors and lenders often require security from the corporate to provide protection against default. This is often a new requirement for corporates that have not needed to provide security to purchase power in the past."

Managing investment risks in the energy transition

David Scaysbrook, co-founder of Quinbrook Infrastructure Partners, argues that many investors have taken on too much risk in renewables, and explains why the US is a far more attractive market than Australia right now

Q You've recently reached a final close on your debut Low Carbon Power Fund. What is the strategy behind the fund?

David Scaysbrook: In many respects, it's a continuation of what Rory Quinlan, [Quinbrook's other co-founder] and I have been doing for a long time now: focusing on value-add energy infrastructure opportunities in the UK, US and Australia. But we've done a couple of things differently in this latest fund.

Firstly, we decided to combine our distressed-assets strategy with our new-build strategy. When we were at Capital Dynamics, we executed those distinct strategies in separate funds, but at Quinbrook we decided not to distinguish between them. We wanted more flexibility to be opportunistic and to execute on the best deals that came along in order to boost investor returns. This also reflected our view that we will see more distressed acquisition opportunities in renewables.

The second difference was to take a more private equity-style approach to building our portfolios, meaning that we've been sponsoring teams and building platforms in addition to a project-specific focus. We are building five platforms within the fund: three in the US, one in the UK and one in Australia. These contain a mix of operating and development assets in utility-scale solar and wind, distributed solar, battery storage, gas peaking and methane recovery. It's a diversified strategy and we've deployed about 40 percent of the fund to date.

> "We're seeing long-term offtake agreements being priced on a flat basis rather than escalating, which means you carry a degree of inflation risk"

Q How much are LPs being motivated by ESG considerations now?

DS: One of the biggest emerging themes is the crossover between increased LP focus on impact investing, new asset construction in infrastructure generally and concerns around valuations in the 'core' sector. We preach that if LPs want more tangible ESG impact from the deployment of their capital then they need to partner GPs that are building and developing new assets, which we do.

We understand that development and construction is higher risk, but we have the necessary industrial experience going back three decades. In the last two years or so LPs have been getting on board and have convinced their trustee boards and CIOs that investing in new-build infrastructure and value-add strategies can deliver the dual objectives of tangible and measurable ESG impact along with higher returns. This is contrasted with M&A strategies which rarely offer incremental ESG impact and are usually fully priced from a valuation risk perspective.

Q What's your view on where the renewables sector is heading, and the amount of risk investors are taking?

DS: We believe that investment risks in renewables are significantly greater now in many key respects than they have ever been. There are several reasons for this.

Firstly, contractual offtake tenors are getting shorter at a time when having con-

Hands on

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tracted revenues has never been so critical for mitigating downside risk. It's now rare to get a 25-30-year offtake agreement for power with a creditworthy buyer. Our general view is that – almost without exception and in every market we operate in – assets are trading on an overly optimistic view of the electricity prices they will be exposed to in the future. That's creating an illusory IRR in many investment 'base cases' that doesn't fit the descriptor of 'risk-adjusted' returns at all.

Secondly, we're seeing an unprecedented change in both the efficiency and capital cost of wind and solar projects as well as transformational impacts from battery storage. As efficiency goes up and capital costs come down, electricity prices also inevitably go down and potentially stay down for a long time. Yet we're still seeing a continuation of these 'hockey stick'-type power price projections on many projects, which makes no logical sense. There are very few commentators calling the prices of solar, wind and batteries in an upwards direction, so there's an absolute disconnect there that we think will cause a lot of investor pain.

Thirdly, we are seeing long-term offtake contracts being priced on a flat basis rather than with an annual escalator meaning that the sponsor is bearing more inflation risk. We have never seen so many 20-year power sales contracts being priced flat until now, especially while money is cyclically pretty cheap and inflation remains low. Generally, we see that the equity rate of return on that 20-year flat revenue profile is not offering adequate compensation for the inflation risk and the simple payback periods have been stretched too far.

And finally, there are unforeseeable changes in pricing and regulation to come by virtue of the stresses that an unprecedented splurge of intermittent renewables is having on centralised power grids.

> "The Australian power market has witnessed heavy intervention from both state and federal governments with pet projects and petty politics making it a 'minefield' for long-term infrastructure investors"

It is important to emphasise that there are ways to avoid, mitigate and manage many of these risks, but bidding for assets in competitive auctions does not afford you that risk buffer. We think that investors who consider operating assets as 'de-risked', and therefore a sounder investment than a 'develop and build' strategy, may need to reflect more on the risks of overpaying in an auction and having inadequate buffers to cope with the inevitable 'downsides' to come.

Q Why are investors taking on these extra risks?

DS: Because of the weight of capital that has entered the infrastructure sector and the stock of assets now built and operating. The many facets of the energy transition serve to highlight how many unknowables there are and why making more conservative investment assumptions to create a buffer for downside risk is so essential.

There has never been a more important time to have contracted revenues to protect the simple payback of invested capital. But having contracted revenues offering price certainty, a hedge to inflation and the prudent allocation of risk to the offtaker is almost 'nirvana' in today's markets. Equity returns in renewables have compressed in recent years but not because investments are 'less risky'.

Q What's your outlook on the US and Australian markets, and how do they compare?

DS: The US is a deep, liquid, fragmented and diverse market that is constantly offering us the full gamut of opportunities for our strategy, whether it's new build, development projects without access to completion capital, or distressed M&A opportunities. It's not without its risks, of course, but it's the market that just keeps giving in terms of dealflow and diversity of opportunities. The general regulatory trends are also very positive.

Australia, on the other hand, has been a 'basket case' in energy policy terms for at least five years, and it's only deteriorated. It is quite incomprehensible what has gone on from a political perspective. The Australian power market has witnessed heavy intervention from both state and federal governments with pet projects and petty politics making it a 'minefield' for long-term infrastructure investors. The risks, as things stand, are not compensated for by the returns on offer. There are just better places for Quinbrook to commit our investor's capital

We also think there's a significant risk that investors in certain Australian renewables assets will lose all their equity. We can only see value in assets such as the firming of intermittent renewables with flexible, peaking projects, and some interesting opportunities behind the meter. But unless things change, we won't be investing anytime soon in renewables that are generating into the wholesale power market unless they are deeply distressed assets or portfolios. It's a shame, but that's how we see it. ■

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Distribution waterfall : hydroelectric offers significant opportunities for investors in renewables

Hydro's role in Europe's energy transition

Aquila Capital's Dr Tor Syverud explains how one of the continent's oldest technologies can play a vital role in a clean-energy mix

Solar power, both photovoltaic and solar thermal, and wind farms, both onshore or offshore, are mainstays in the discussion of renewable energies. Both are profiting hugely from recent advances in technology that have made them more efficient as well as cheaper. However, investors need to look beyond the headlines and remember that there are much older renewable technologies that will play at least as great a role in the energy transition.

Hydroelectric power has been used for more than a century in Europe – since 1878, in fact, when William Armstrong used it to power a single arc lamp. Larger-scale hydroelectricity started 100 years ago in Norway, which still derives more than 95 percent of its energy from this source. This technology is not only tried and tested, but will play a pivotal role in the future of power generation.

For many people, the term hydroelectricity still conjures images of huge reservoirs and large-scale projects, as epitomised by China's Three Gorges Dam. However, besides such stored or single-reservoir plants, there are two other forms of hydropower generation: pumped-storage and run-of-river. The latter allows the construction of many smaller-scale, decentralised plants. Although this type of power depends on a river's flow and is thus susceptible to seasonal changes, it minimises the impact on both the environment and nearby communities. Run-of-river generation is also much less volatile than solar or wind power. Seasons and even average amounts of rainfall are more predictable in the long run than the local weather. And there is very little correlation between, on the one hand, the seasons and rainfall levels and, on the other, the output from run-of-river power plants.

Pumped-storage hydroelectricity uses

two reservoirs to profit from price fluctuations on the electricity market. In times of low demand or high production, when power is cheap, water is pumped into the higher reservoir. During times of peak demand the water flows back down through the turbines, generating power that is then sold at peak prices.

COMPLEMENTARY REMEDY

All three types of hydroelectricity have attractive risk-return profiles. Although large-scale projects demand a relatively high initial expenditure, their low operating costs and longevity make them competitive sources of renewable energy, especially over the long term.

However, storage and pumped-storage hydroelectric plants will play an even more crucial role in the transition than just as additional sources of energy. They are the perfect complement for intermittent renewable sources such as solar or wind power. A simple look at an average day in a first-world, service-driven economy makes this obvious. Although wind may blow, or not blow, at any time and the sun delivers most of its energy around midday, demand for electricity surges in the morning, when people get up, switch on their lights, and use transport to get to school or work. Demand then peaks in the evenings, when commuters use transport to return home, electric lights replace daylight, dinners are cooked, and televisions and other electrical devices are switched on.

This means there will be times when demand far exceeds the availability of solar and wind power, as well as times when these volatile sources of energy generate more electricity than is needed. This discrepancy needs to be urgently addressed. Excess energy during peak production has to be stored, and excess demand during calm nights and windless, cloudy days somehow has to be met.

For Aquila Capital, this is where stored hydro comes into the picture. It still is the most cost-efficient method of storing large amounts of energy. Conventional and pumped-storage hydro plants are thus poised to become the central balancing element in a renewable energy mix, because they provide one huge advantage: control.

Hydroelectric power is also one of the most flexible sources of energy. The output of both storage and pumped hydroelectric plants can be varied rapidly to meet changing demands. As long as there is enough water in the reservoir, power generation can be turned up within minutes if necessary. Pumped-storage plants can absorb large amounts of excess electricity, thereby reducing the stress on electricity grids and preventing energy from being wasted. They are therefore the ideal complement not only to high-output, high-volatility renewables such as wind and solar, but also to short-term storage methods such as batteries. These are faster – with reaction times in the milliseconds – and thus perfect for balancing sudden peaks in consumption or production.

Notwithstanding the fall over recent years in the cost of producing batteries, their material cost and shorter lifespans will make them more expensive than amortised hydro plants. This means it will not be viable to store large amounts of power in batteries. The ideal solution will again comprise a combination of technologies: batteries to balance short-term surges and hydro to store energy for long stretches.

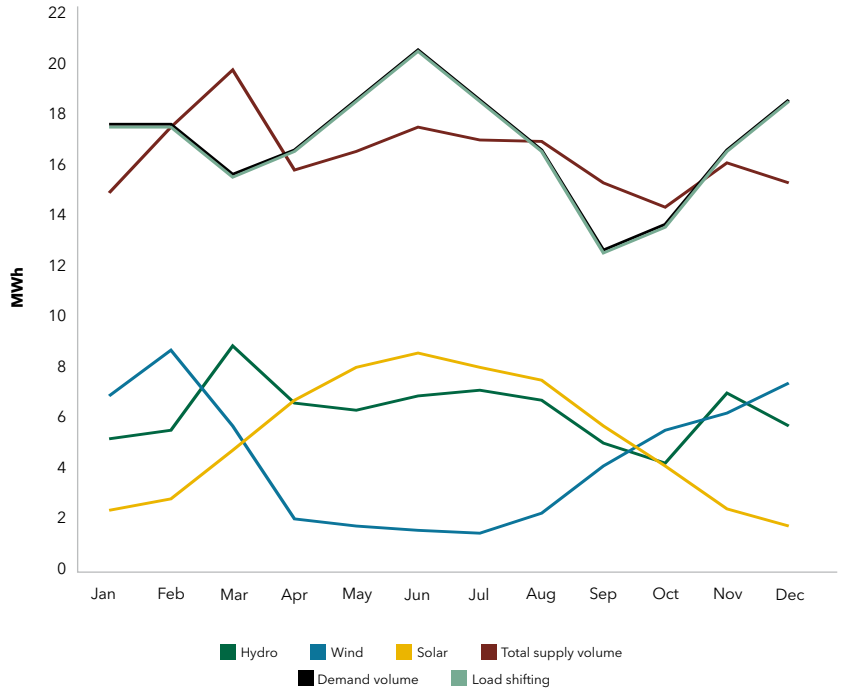
NEW REVENUE STREAMS

For investors, hydroelectric power offers new revenue models. In total, we can identify four potential revenue streams: standby services, grid balancing services, capacity revenues and energy revenues. The last of these is the most traditional: hydropower will still be fed into existing power grids at market price. The other three derive from the load-shifting capabilities of storage and pumped-storage hydro.

In modern energy markets, however, output is not the only important figure. Investors should also consider the crucial capture rate. This describes the relationship between the average market price of energy in a given timeframe and the revenue actually achieved by an energy supplier. For example, a traditional base-load supply – such as that provided by coal or nuclear plants, which feeds a constant amount of energy into the grid throughout the day – will be paid more during peak demand and less during other periods. Assuming its energy output has continually been below total demand, its capture rate will be exactly 100 percent. Run-of-river plants usually achieve a capture rate of about 95-99 percent. Solar plants currently range slightly above 100 percent, but are expected to see deteriorating capture rates as a lot more solar enters the grid. Wind power is dependent on the whims of the weather and is usually unable to achieve 100 percent. In markets where there is a large amount of wind energy capacity being built out, deteriorating capture rates are also expected. The infamous California 'duck curve' is a good example. Although solar and wind energy output are highest during the middle of the day, energy

RENEWABLE ENERGY MIX IN 2018

Hydro will provide increasing opportunities for investors as it forms a greater part of energy provision



Source: Aquila Capital; data is illustrative and does not relate to a specific geographical area

demand is usually at its lowest, making huge energy storage capacity indispensable. By contrast, storage and pumped hydro can retain energy for substantial amounts of time and release it specifically during peak price periods.

According to projections from Thema Consulting Group, hydroelectric plans will be able to achieve capture rates of up to 125 percent and therefore profit immensely from market fluctuations. Projecting a future in which societies will be largely dependent upon renewable energy, a portfolio that combined solar, wind and hydropower would be able to sustainably reach and at times exceed a 100 percent capture rate.

During times of peak production and low demand, there is also a need to balance the grid and prevent power surges. Of course, one way to prevent the grid from exceeding its capacity is to take some energy generators offline. This is the current modus operandi for many wind power stations in Germany, where grid infrastructure has not caught up with the maximum output of renewable energy during stormy days (and nights, when demand is low). This is more difficult with solar plants and, even where it works, is a waste of energy. Grid balancing will thus become an important service in the near future, and one that service pumped or storage hydro plants will be able to perform efficiently and at competitive prices.

HIGH ENERGY

Power-purchase agreements are a comparably recent revenue stream to which hydro is ideally suited. Energy-intensive companies, such as those active in the digital economy, are already willing to pay not only for the energy generated and delivered but also for capacity. These companies depend on reliable energy supplies, without surges or scarcity to deliver their services. PPAs guarantee that a certain amount of energy will be available at a moment's notice whenever needed. In the case of hydro, this means water stored in reservoirs. If cloudy and calm weather prevents solar and wind plants from producing sufficient energy, PPA customers will be able to fall back on stored hydroelectric power.

GET CONNECTED

Hydro, like any other kind of renewable, is dependent on suitable locations. Run-of-river plants need fast-flowing rivers, preferably with rapids or waterfalls. Conventional dams need large river valleys and have a significant environmental impact, while pumped-storage plants need both large geographical height and ready water supplies.

A sustainable future for European renewable energy will therefore require interconnections between local and national power grids in order to combine different sources in different locations and thereby offer reliable electricity supplies to all customers. The fewer interconnectors a country has, the greater storage capacity it will need. Governments are still struggling to meet the demand for flexible, decentralised and crossborder energy grids. Scandinavia and the Iberian peninsula are trailblazers in this regard, and are connecting more and more with the rest of the continent.

Yet this process is much slower than the transition to renewable energy production. And even if Europe were connected in one large grid, storage capacity will always be needed in a renewable energy future. Investors should aim to have a balanced energy portfolio that is diversified accordingly: with solar and wind power stations to reap peak production, in combination with batteries for short-term and hydropower for long-term balancing.

In the future, our energy supplies will be diverse and complementary. Long-term, sustainable investments in the sector should be so too. ■

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Adapting to a post-incentive world

Nicolas Rochon, founder and managing partner of RGREEN INVEST, explains how the post-incentive era has opened up new markets and changed the way his firm invests across Europe

Q How has the shift from a policy-driven market to an economically viable one affected your role as an investor in Europe's energy transition?

Nicolas Rochon: I started investing in the energy transition in 2003. Ten years later, RGREEN INVEST launched its first fund. At that time, the market was very much policy-driven. There was strong state support to finance the expansion of the sector, with long-term contracts and high cashflow visibility. As a result, governments were a key part of our risk assessment since political stability was critical when underwriting government-subsidised revenues. We primarily had to invest in mature markets such as France, Germany and the Nordics. Southern and Eastern Europe were riskier markets to operate in.

Things changed around 2015. The alternative energy market became increasingly competitive. The issue moved away from getting comfortable with government risk to focusing increasingly on the ability to produce alternative energy more efficiently.

With nuclear energy occupying an important part of the energy mix, France's cost of electricity production has remained low. As a result France does not invest in renewables to decrease the cost of energy, but rather to reduce its carbon footprint in order to meet the targets set out in the Paris Agreement on climate change.

If you look at Southern and Eastern European countries, such as Spain, Italy and Greece, those markets are becoming increasingly attractive thanks to the combination of high market prices and abundant renewable energy sources.

> "Renewable energies have no boundaries, and as long as interesting opportunities arise, we will consider them"

Our first two funds, launched in 2013 and 2015, were more than 75 percent invested in France. The latest one, which closed in January this year, has already deployed 70 percent of its €307 million, and should be less than 30 percent invested in France. Renewable energies have no boundaries, and as long as interesting opportunities arise, we will consider them.

Q Your geographical remit has changed as a result of the move away from incentives. What about the nature of the investments you make?

NR: We have been able to adapt to this shift by allowing ourselves to use a broader range of solutions. Our instruments now range from equity to junior debt or mezzanine, in order to capture the best risk-return opportunities depending on the geography and the technology. INFRAGREEN I and II invested mainly in debt through bonds and convertible bonds. But with the shift away from an incentive-based environment we increasingly consider equity investments. INFRAGREEN III should be fully invested by Q4 2019, with two thirds in debt and one third in equity. When investing in equity we invest alongside our historical partners to benefit from added operational and technical expertise.

We are going to launch INFRAGREEN IV later this year with a €500 million target, and 50-50 mix between equity and debt.

Q What sectors do you see as particularly interesting?

NR: The sector very much depends on the geography. In Southern Europe, solar is naturally attractive. Poland has optimal wind conditions and biomass can be interesting in locations such as Croatia, where wood resources are abundant.

We also see energy storage as an appealing opportunity. Storage systems are required to stabilise the network owing to intermittent renewable energy production. We have already made some energy storage investments in France. The industry is still nascent, but we expect to see a lot more over the next two to three years.

Distributed energy generation and clean transportation are also interesting areas. We believe that energy transition is not only linked to clean energy production, but also to energy efficiency. We expect also to see a lot of opportunities coming from that side of the equation.

Q Has the shift away from incentives changed the stage of investment that you focus on?

NR: The development risk is less important when you are not pressurised by hard deadlines to secure incentives. The main criterion is no longer to secure an attractive feed-in tariff, but rather to use the most adapted technology in a given location. We can now get involved at an earlier stage than the usual 'ready-to-build' or 'turnkey' stages. This is the strategy we are implementing in Italy and Spain, for instance. Our investment decision is based on our forecast of the average levelised cost of energy for the next five or 10 years, and not on policy incentives. In those circumstances, we are prepared to take on development risk – it accounted for just under 10 percent of our last fund. But when subsidies are involved, we will only invest at the construction or brownfield stage. The mix of stages reflects our investors' expectations of a balanced risk-return profile. The financial instruments used also have an impact.

Q How are the competitive dynamics of the market changing?

NR: Back in 2003, we were one of the first independent players in this market. Competition has increased, in particular for big projects with strong feed-in tariffs and long-term cashflows. Overall, however, there aren't many specialist firms such as ours with strong historical ties to independent mid-sized developers, so the market remains big enough for us.

> "The main criterion is no longer to secure an attractive feed-in tariff, but rather to use the most adapted technology in a given location"

We do not compete with the big infrastructure funds as our deals are still too small for them – our average investment size is between €15 million and €20 million. Competition only starts to really kick-in on transactions valued between €50 million and €100 million, where there is also a significant consolidation among players.

Q Where you do face competition, does it come down to price or are there other factors involved?

NR: Price is part of it. Another way to secure a project is to get involved at an earlier stage. But RGREEN INVEST's true added value is the quality of its relationships with robust independent developers. We have been working with our partners for years and provide tailor-made financing solutions to meet their specific requirements. Furthermore, we often invest alongside these partners. This gives us a strong edge over the competition.

Q How would you describe underlying investor appetite for specialist energy transition funds?

NR: Overall, investor appetite is strong and I see three main reasons for this. First, renewable energies are driven by strong top-down objectives, such as those outlined in the Paris Agreement. Second, the technologies are now mature and renewable energy is a profitable asset class on its own. And third, as we can see in France, local regulations are encouraging LPs to invest in this asset class. They are able to invest over a sufficiently long timeframe to support the energy transition.

Q Incentives are no longer required. But what additional support would you like to see from European governments to facilitate investment in the energy transition?

NR: We don't need price support anymore, but we do need simplification in terms of the permit process. Of course, it remains crucial that environmental studies are performed thoroughly, but any streamlining of the development process would be beneficial.

Q Finally, what's next for the energy transition in Europe?

NR: It is just a beginning. Over the next 10 to 20 years, renewables will become a far bigger part of the energy consumption mix in Europe. A lot of new technologies are being developed and our approach to the distribution of electricity will be overhauled. I feel highly optimistic for the sector, and for RGREEN INVEST to play a key role in the energy transition. ■

Canada's example: Vancouver is now one of the greenest cities in North America

The infrastructure revolution

Can a net zero-carbon world exist as demand for energy continues to grow? InstarAGF president and CEO Gregory Smith looks at the potential for sustainable infrastructure to deliver triple bottom-line results: value for the environment, the economy and the community

In 2019, we are on the cusp of the greatest transition ever undertaken by humankind, one that demands a staggering global effort: building an environmentally sustainable economy.

For the past 200 years, our prosperity has been driven largely by fossil fuels, which today provide 80 percent of human energy needs. Cleaner energy sources, such as wind and solar power, have expanded rapidly, but not enough to tamp down greenhouse gas emissions, which continue to escalate in North America and globally.

A report late last year by the United Nations Intergovernmental Panel on Climate Change (IPCC) suggested global warming must not exceed 1.5 degrees Celsius – less than the 2 percent rise agreed by signatories to the Paris Climate Agreement – if we are to limit the intensity and frequency of extreme climate events and scarcity impacts on resources, ecosystems, biodiversity, food security and cities to merely moderate levels. According to the IPCC, achieving this target will entail a shift to net-zero emissions across the world by 2050.

Two hundred years ago, the Industrial Revolution launched an era of accelerated change that continues to shape human society. We are in the midst of what the World Economic Forum refers to as the Fourth Industrial Revolution, a digital phase that is rapidly and dra-

matically fusing the physical, digital and biological spheres.

Accomplishing net-zero emissions over the next 30 years would represent a global transition that is faster and more profound *than any other* in human history. Although a zero-carbon economy is technically feasible to attain, the larger question is whether we are collectively willing to do what it takes to get there. It is an effort that will demand nothing less than an "infrastructure revolution": an unprecedentedly massive, immediate transformation in our energy, transport and community infrastructure.

POWER TO CHANGE THE WORLD

The largest 250 urban centres in the US generate almost 85 percent of the country's gross domestic product and account for 70 percent of its carbon emissions. Because most economic activity is concentrated in urban areas, cities are necessarily at the forefront of the global energy and low-carbon transition.

Cities have an enormous climate footprint. However, they are also integral to fostering innovation, collaboration and new economic opportunities, and are already addressing climate change in a number of ways.

According to the Carbon Disclosure Project, more than 100 cities globally, including several in the US, now receive all their electricity from renewables. At least 100 others receive around 70 percent of their power from clean sources. The C40 initiative connects 94 of the world's largest cities – representing more than 700 million citizens and a quarter of the global economy – as part of an effort to take bold action on climate change in line with the most ambitious goals of the Paris Agreement.

Transitioning to a net zero-carbon world will require a combination of myriad drivers to cultivate synergies and collective impact, and that will be accelerated by governments, the private sector and cities themselves. Urban energy innovation in grid decarbonisation, energy efficiency in buildings and next-generation mobility is vital to North America's long-term environmental and economic viability. Where there is a will, there is clearly a way.

Advances in renewable power generation and distribution, storage and energy management make a shift to clean electricity possible for nearly all uses. While utilities and regulators will play a key role in the expansion of renewables, cities have a vital part to play by setting clear decarbonisation goals, aggregating demand for renewables, promoting energy efficiency and shifting more urban energy consumption to electricity. Strategies and tools available to cities include predictive energy monitors, pricing incentives and technologies such as battery storage, microgrids, smart grids and analytics software, all of which can help customers to better manage their energy-use patterns.

> "In the US, transportation emits more carbon than any other sector of the economy, which means electric transport must become 'the new normal'"

At the heart of grid decarbonisation is wider adoption of district energy to reduce the loads of our urban centres and shrink our carbon footprint while creating new economic opportunities. District energy systems deliver reliable, cost-effective and often renewably sourced electricity that attracts new businesses and development to given areas while lessening demand on the overall grid. Mandating environmental and resilience goals tends to spur the adoption of district energy and can be a catalyst for more integrated sustainable infrastructure planning and investments.

Greater adoption of district energy helps to mitigate the impact from the single largest contributor to a city's carbon footprint: the built environment. Buildings account for about a third of energy use and about a quarter of greenhouse gas emissions, yet their carbon-reduction potential remains largely untapped.

More stringent energy efficiency, net zero-carbon codes and standards for new buildings, and the retrofitting of existing buildings need to be major policy priorities.

TRANSFORMATIVE EFFECT

More efficient buildings effectively support the transformation of the entire energy system. The International Energy Agency has estimated that the rapid deployment of high-efficiency lighting, cooling and appliances, for example, could save the equivalent of 75 percent of today's global electricity demand by 2030. Such upfront investments pay for themselves over time while reducing the cost of energy and increasing the energy efficiency of the economy.

By setting net zero-carbon construction and development goals and requiring the renovation of existing structures so they can import energy from renewable sources and be more efficient, our cities can chart a new course and achieve important resiliency outcomes. Over the next 20 years, more than 60 percent of the world's total building stock is projected to be built or rebuilt in urban areas. This will provide cities with an unprecedented opportunity to phase out carbon emissions by 2050.

In the US, transportation emits more carbon than any other sector of the economy. This means that electric transport must

become "the new normal" if there is to be greatest possible reduction in overall carbon emissions.

Solutions in the transport sector are accelerating. The long-term trend towards electric vehicles means power utilities have a significant market opportunity as demand moves away from petrol. However, capturing the benefits of this transition will also require low-carbon power generation. New partnerships across cities, and involving power providers and vehicle manufacturers, can help to ensure that the shift towards electric vehicles also means a move towards clean mobility.

Global sales of electric automobiles jumped in 2018, according to Bloomberg, while advisory Energy Innovation projects the sector will represent about 65 percent of light-duty vehicle sales in the US by 2050.

NEXT-GENERATION MOBILITY

Innovation and electrification within transport, including the evolution of driverless vehicles, is about more than new technology. Next-generation mobility has the potential to redraw city boundaries and enhance quality of life by facilitating a shared system that offers improvements in accessibility, affordability, sustainability and travel times.

Overall, the International Energy Association estimates that re-orienting urban transport systems to encourage walking, cycling and public or shared transit could save $21 trillion in energy costs by 2050, while helping to alleviate the impact of climate change.

Beyond cities, the key to creating a net zero-carbon world lies within the industrial sector, which contributes about 30 percent of greenhouse gas emissions globally, according to McKinsey. Decarbonising the planet by 2050 will also depend on the ability of the power and utilities sector to substantially reduce its own emissions.

It will need to do so even as demand for power rises and as other sectors make the transition from fossil fuels to electricity in order to reduce their own carbon emissions. Managing this balance will require a multi-faceted approach, including improvements in end-use efficiency; continued substitution of zero or lower-emission power sources; better grid flexibility and storage; and the use of carbon capture on remaining fossil fuel-based power generation.

The net zero-carbon endeavour will also depend on cross-sectoral, governmental and private-sector partnerships and community engagement to help harness climate action as a driver of innovation, competitiveness, risk management and growth.

It will involve establishing clear, long-term signals and supportive government policies to set the required pace and scale, and to encourage the investment, creativity and community perspective that will help to design an inclusive, zero-emissions future while avoiding stranded assets and poor investments.

In North America and beyond, the Global Commission on the Economy and Climate suggests that achieving greater sustainability and lowering carbon by 2030 could deliver $26 trillion in economic benefits and improve the quality of growth while reducing the social cost of carbon.

Studies show that directing investments into low-carbon infrastructure projects in cities delivers greater returns more quickly than conventional infrastructure, including by improving economic productivity, creating jobs and reducing health and energy costs. Such initiatives most positively affect lower-income citizens by elevating overall quality of life, and thereby contributing to more equal cities.

Although the IPCC report underscores the need to manage our "carbon budget" and sets a ceiling, both the panel and the Paris Agreement are silent on specific timelines for collectively cutting emissions. Mitigation is occurring, but there is a pressing need to accelerate innovation in policy development, national and international cooperation, the deployment of technology, and input and action at the local level.

CONTINUED CHALLENGES

Fundamentally, the key drivers for a net zero-carbon world in the 21st century are collaboration and boldness. Many questions remain, including how to meld innovation with behavioural changes, how to overcome political and economic entrenchment and how to integrate energy transition goals with urban and social infrastructure planning. It is possible that many of the best tools to accelerate the new energy transition and tackle climate change have yet to be invented.

But one thing is clear: the "infrastructure revolution" must be accomplished in a manner that energises, "greens" and grows our economies to create opportunity for everyone. Whether time will prove to be an ally or an enemy, it is certain that the time for this revolution is now. ■

IPCC REPORT: FIVE KEY FIGURES

1.5C
Maximum temperature increase to avoid worst of climate change

12 years
Span of time to avoid temperature increase above 1.5C

45%
Cut in CO2 emissions from 2010 levels needed by 2030

85%
Amount needing to be generated from renewables by 2050 to keep temperature increase to 1.5C

91
Number of authors who prepared IPCC report

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Rise of the corporates

Stephane Wattez-Richard, investment director at CONQUEST, on how corporate demand for clean energy is reshaping the investment environment

Q What are the biggest changes you have seen in the energy transition market over the past few years?

Stephane Wattez-Richard: We are moving away from assets with subsidy-backed revenues and towards a more merchant world across most western European markets. It is a challenge in the short term because of the volatile merchant electricity prices. It has become more challenging for investors to find transactions with secured long-term revenues on deal completion. But fundamentally it represents an opportunity. Investors are mitigating that merchant risk by soliciting power-purchase agreements – from utilities, but also from corporate offtakers – in a not yet completely structured PPA market.

Initially, demand came from the GAFAs and a few dozen more, who were keen to power data centres with green electricity. But corporates – and, in particular, those operating in electro-intensive industries, including chemical, pulp and paper and steel and metal – are also accelerating their shift from conventional power sources to renewables with fixed price terms attached. They are doing this primarily to mitigate the increased power price volatility they face. But they are also doing it to act against climate change, which is what their own stakeholders are demanding. Merchant risk is accelerating the maturity of this corporate PPA market.

Q What impact is the rise of the corporate PPA having on deal structuring?

SWR: These offtakers now have a seat at the table early in the investment process. It brings more complexity – there are around 20 ways of structuring a PPA – and your future revenues depend on the terms you are discussing with these increasingly key stakeholders. You bring more corporate counterparty risk to your deal.

> "We have always limited leverage in our projects. The financing profile we favour matches the constraints imposed by PPAs"

It also impacts the level of leverage you can put into a transaction. A PPA will generally not cover 100 percent of electricity production. It will often fall somewhere between 30-70 percent. That means you can put less debt into a deal than would have been the case in the past, when many renewable projects were highly leveraged. We have always limited leverage, so we can distribute yield from our projects early on to our investors. The financing profile we favour therefore matches the constraints imposed by PPAs. But for those that have historically pursued highly geared deals, this is no longer possible.

Q Which sectors are you primarily focusing on?

SWR: Our investment strategy is aimed at sustainable infrastructure. We are investing in assets that mitigate climate change and we keep a strong focus on renewables, of course. But we also invest in other assets that can help accelerate the energy transition. The more renewables or distributed energy assets you find on a local electricity grid, the more intermittent electric power becomes, and the more unstable the grid. Energy storage assets help mitigate intermittency and maintain grid stability, and they will help in managing grid congestion. However, private investors face the challenge of finding the right storage business models with adequate risk-adjusted returns.

Q What about opportunities to assist corporates with their energy efficiency?

SWR: Although industrial players are

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increasingly looking to source green energy, some are also electrifying more of their manufacturing processes to make them less dependent on fossil energy, which creates additional investment opportunities. These companies are looking to re-invest in their plants. We are working with those corporates to help them accelerate their transition.

Q Which regions in western Europe are the most attractive right now?

SWR: Northern Europe is attractive to us, with its sophisticated transmission and distribution operators, and its strong track record on renewables and energy efficiency coupling. Each European market is at a different level of maturity regarding its renewable targets. Depending on the upgrading of its grid, each also brings its own challenges. The timing of the phasing out of nuclear power will impact the speed of the energy transition in France. Germany, where there is a high level of renewables already, will accelerate further, but its market is expected to remain extremely competitive.

There is a meaningful difference between the markets in light of the quality of the local grids and their ability to deploy grid connections quickly enough to address the accelerated deployment of renewables. This is a common bottleneck we face in several markets. Ireland for example, which is likely to deliver on its high renewables goals at 30 percent in 2020, is working to upgrade its grid sustainably and thereby continue spearheading its energy transition.

In spite of those individual challenges, the stable market and regulatory environment are among the reasons that we and our investors like this region.

Q Do you invest in southern Europe?

SWR: Portugal, Spain and Italy remain attractive and deep markets in wind and solar. Even though competition has been high, we see the opportunity to go after smaller assets and aggregate them into larger portfolios, which is a strong driver of value creation.

Q Are you seeing more competition from corporates on deals, as well as corporates supporting transactions with PPAs?

SWR: They are not direct competitors. Large energy management corporates, usually former local incumbent utilities and their main challengers, are shifting from traditional 'thermal' assets to renewables. These corporates are eager to acquire strong pipelines of renewable assets and lead consolidation of the European developers market. Some keep these assets on their balance sheets once they have been developed. We usually partner with those that would rather put those assets back on the market. The synergistic advantages these energy companies bring mean they can be highly competitive on big deals across the development and operating asset management value chain. But there is still room for us as, once the asset is fully developed, we have a different cost of capital.

> "We are facing a revolution as three sectors – energy, digital and transport – converge"

Q What does the rise of corporate PPAs mean for the long-term future of the assets you invest in?

SWR: It is good news as it confirms the long-term nature of the assets we back. We can clearly see value in these assets beyond the next 20 or 25 years.

Their performance will have decreased, of course, and there will be a need to retrofit or re-invest in the energy production plant itself at some point. But these assets are usually sitting on good locations with long-term leases and are already connected to the grid. Once that initial PPA period has expired, there will most certainly be a window to seek additional secured revenues, and financing, for the years ahead. It is always challenging to put a number on this type of value so far in advance, but we see it as very unlikely that these assets will be dismantled. A few years ago, they would have been seen as having a defined lifespan. But as electro-intensive companies shift towards sourcing greener energy, they are increasingly seen as evergreen assets.

Q What comes next for the energy transition process in Europe?

SWR: We see a strong convergence between the different subsectors that make up the sustainable infrastructure investment ecosystem, largely because of the development of data management and digital technologies.

In addition, electromobility has already become an important theme as the integration of electric vehicles to the grid creates new opportunities for investment.

The expected use of smarter energy data management systems, accelerated by the expected roll-out of AI technologies, presents an unprecedented opportunity to manage risk, short- and long-term production, and performance forecasts even more effectively, and to generate more value.

We are facing a revolution as the energy, digital and transport sectors converge. This is an area we will be concentrating on heavily over the next few years. ■

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Capital connection: Asper platform Vasa Värme is building a new heat network in the Ekerö municipality in Stockholm's commuter belt

Greenfield sustainable infra platforms are a formula for value creation

CEO and co-founder Luigi Pettinicchio explains why Asper Investment Management is focusing on a combination of platform building and early-stage development

The first weeks of 2018 were an exciting and busy time at Asper. We had just completed the spinout from our mothership private equity firm Hg, transitioning from a specialist team within a large organisation to an independent manager with over €1 billion AUM through two sustainable energy funds and additional vehicles. One of the key questions we faced was how to define our investment outlook.

Asper is an infrastructure manager focused on value-add strategies, so the sustainable energy market in Western Europe presents obvious challenges. Prices for many assets are above their historical norms and the IRR premiums that investors could achieve from taking construction or early operations risk – typically 200-300 basis points four to five years ago – have shrunk to challenging levels.

We think some of this decrease is 'healthy' de-risking, with recognition of the strong track record of delivering construction projects on time and on budget and more accurate forecasting of energy production. However, we also think that a significant portion of this re-pricing is cyclical rather than a reflection of the asset class's intrinsic risk-return profile. With the conviction that it is not our job to call the peak of the market, our team decided to remain away from the 'WACC shootout' and stick to our value-add investment DNA.

This means, firstly, that we will continue to be highly selective and only pursue opportunities where we have a clear path within our control to deliver above-market returns. We believe that the way we can do this is through investment in greenfield opportunities. For Asper, this means backing developers from an early stage when projects are not yet ready for construction, sharing the development risk and gains with these developers, and building asset-based companies in partnership with them.

Many infrastructure investors have shied away from development stage opportunities. These investors have recognised the challenges in assessing the chances of securing positive planning permission or managing capital at risk in a project before it becomes 'bankable'. We believe that to succeed with such development projects, cash must be drip-fed in to mitigate the risk of capital loss; exposure must be ruthlessly staged through development milestones; and, most importantly, a complementary relationship with the developer (which tends to be 'glass-half-full' and see opportunities everywhere) must be preserved.

This approach is only possible when team members have a specialised investment skillset allowing them to design tailored incentive systems, coach management teams through growth and realisations or set up control and ESG functions without disrupting the core development business. We believe these skillsets are closer to the 'private-equity toolkit' than those employed by core-focused infrastructure investors.

The advantages of this approach can be substantial. By funding development-stage projects, investors can capture the value uplift from bringing projects to being construction ready, with all contracts lined up and capital ready to be committed. This can naturally translate into important capital gains for the investor, or the opportunity to be part of the construction process with potential returns that are 300-500 basis points higher than those typically seen across the market. It also means avoiding the temptation of using aggressive assumptions to win assets in auctions, something we are seeing more and more of these days.

Focusing on projects at an early stage allows us to be more selective, to work only on the best sites and to design and optimise projects to higher levels of cost efficiency. This can be achieved, for example, by working alongside equipment suppliers to optimise layouts and planning envelopes. In today's competitive market, the ability to provide a better solution is key to securing any form of contracted offtake (whether regulated auctions or private tenders) or to winning over customers (for heat networks).

BUILDING PLATFORMS

We have an established approach to launching greenfield investments: once we have comprehensively reviewed and selected a market, we aim to identify and back one of the premier (top two or three) developer teams and support them to build out not just a portfolio of assets, but also an industrial-scale company around that portfolio. We call these 'platforms' and the concept is central to our investment approach. Platforms enable a combination of the consistent cashflow returns from real assets, with the upside from greenfield development, operational improvements and scale premiums at exit. It is a model we have worked with successfully across several Western European countries and sectors and through which we have delivered buy-and-hold IRRs in the 13-14 percent range and buy-and-sell IRRs of above 20 percent.

> "An IPP with a well-established footprint will be well positioned to source and optimise its offtake contracts, whereas a 'naked' asset is likely to become a price-taker in auctions and commodity markets"

When shaping an investment thesis, we aim to build what we call 'positive asymmetry': a one-sided risk profile skewed to the upside. To do so requires a very disciplined approach on the infrastructure side of the equation. This might mean mitigating commodity-price risk with stringent requirements on contracted revenues (de-risking the return of capital plus a return) and using more conservative assumptions than the market would do for post-offtake prices. It also means limiting the use of debt to allow for de-risking through yield, and a comprehensive and detailed approach to budgeting for opex and contingencies.

At Asper, we see asset cashflows as a starting point rather than the endgame. The energy industry is going through a deep transition driven not just by the need to decarbonise our generation base, but also by fast-paced technological progress across both equipment and software. Incumbent business models are being challenged and new models are emerging. Our firm view is that focusing only on assets for their cashflows means missing out on exciting opportunities, and can potentially expose investors to unforeseen risks when the cycle turns.

As an example of this approach, we have experience in reducing the balancing costs risk (and capturing extra revenues) by expanding beyond wholesale power generation into trading and supply, thus building a layer of value on top of the asset returns. Another example is our experience with increasing revenue certainty. An IPP with a well-established footprint and an experienced management team will be well positioned to source and optimise its offtake contracts, whereas a 'naked' asset is likely to become a price-taker in auctions and commodity markets.

To achieve this upside, scale is key: platforms that reach critical mass in their respective market unlock operational efficiencies, better financing, access to bolt-on opportunities and scarcity premiums at exit.

Wind and snow: Munkflohögen wind farm was developed by Asper's Swedish platform, Vasa Vind

As the second strand to our strategy, we structure bespoke investment vehicles for these platforms. This allows us to bring together highly sophisticated, like-minded institutional investors with an appetite for value-add greenfield strategies who want more control over their investments than they would typically get in a classic blind-pool fund structure. For lack of an established terminology, we call these structures 'managed co-investment partnerships'.

Raising capital for specific platforms through these bespoke structures has several advantages both for the institutional investors and for us as a manager. An obvious one is that investors have much more control over their portfolio allocation: they can assess the specific opportunity upfront in the same way they would assess a direct investment – but with the advantage of doing so alongside an experienced manager with whom they are strongly aligned. Secondly, it provides the basis for a lasting relationship.

With Asper seeking to deliver a new platform every 12-18 months, investors working with us will see a regular flow of highly selected opportunities, and will be able to calibrate their exposure to each of them depending on their specific portfolio objectives.

A further feature which is highly attractive to investors is a tighter J-curve. This occurs, firstly, because the origination lag is avoided, and secondly because there is high visibility on commitments. At Asper, we originate and qualify the platform one to two years before raising capital for investment, allowing us to lock-in a proprietary pipeline of 70-80 percent of the total investment volume with an upfront commitment of at least 30-50 percent of the total capital.

SOURCING CO-INVESTORS

We have found that institutional investors prefer this to the profile offered by typical blind-pool funds, making it a structure well-suited for highly specialised investment strategies focused on greenfield development. We believe that tighter J-curves are a true win-win, meaning not only lower gross-net spreads for investors, but also a potentially better outcome for the manager from performance incentives.

These models have taken some time to develop but have progressed as institutional investors have become more interested in expanding their programmes beyond conventional funds. Recently, we have seen how a number of investors are seeking to capture the large opportunity from increased direct allocations by taking a more flexible approach to co-investments, leveraging the capabilities of a sophisticated manager while preserving an element of discretion. This hybrid formula is capable of delivering many advantages. However, it requires engaged investors with the resources and knowledge to execute the opportunities, and a 'high-touch' approach in their engagement with managers, providing scale, flexibility and commercial agility.

Single-platform strategies are by definition more concentrated than a traditional blind-pool fund, but we think that seeing this as a limitation is misplaced. After all, whether investing directly or through co-investments, institutions have the opportunity to think about diversification within their broader portfolio.

For that reason, we think co-investment partnerships enhance the diversification opportunities for institutions as they offer access to pre-defined strategies through stakes that can be spread across several platforms, with a level of control that is not possible in blind-pool funds. We are currently working with investors on these types of partnerships across the renewable power and sustainable heat network industries, enabling growth of existing portfolios and fostering the build-up of new ones.

It has only been a year since our transition to an independent manager and we remain clear in our conviction of how best to deliver on our core mission: to build new, sustainable infrastructure from the early stages, thereby helping management teams to grow industry-leading companies around A-grade assets and thus deliver consistently superior results for our partner investors. ■

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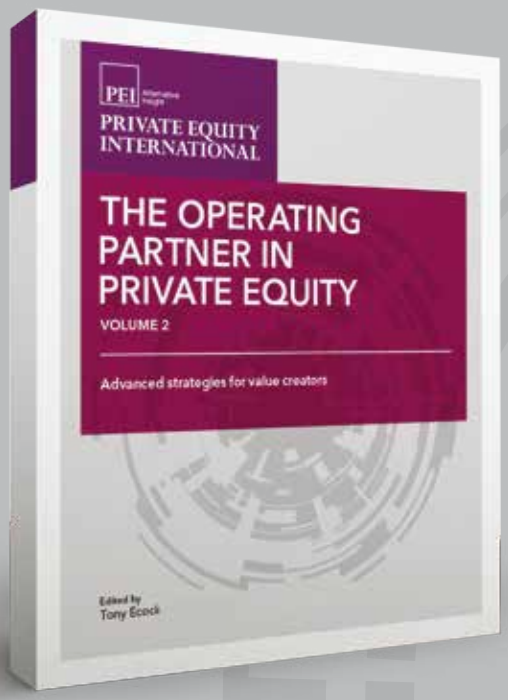
Volume 2

Advanced strategies for value creators



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- Scott Glickman, Dan Soroka and Sara Boyd of Graham Partners outline a programme for proactively identifying and reducing business model risks.
- Mark Gillett of Silver Lake Partners and David Moss, an independent adviser, provide a framework for assessing and implementing transformational versus incremental change.
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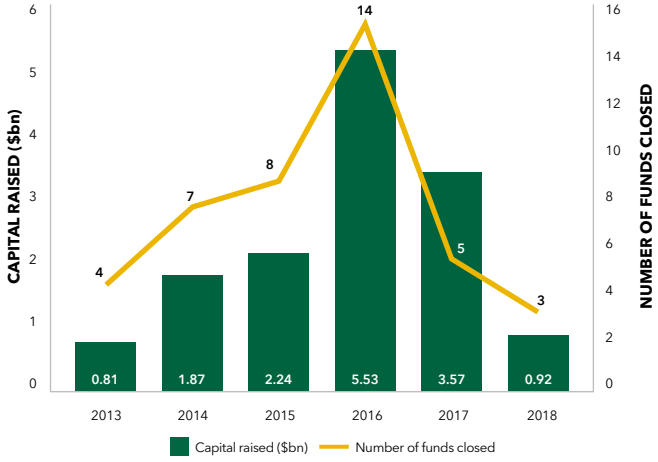
Fundraising overview

The number of fund closes and the amounts of capital raised for renewables investments continued to fall in 2018

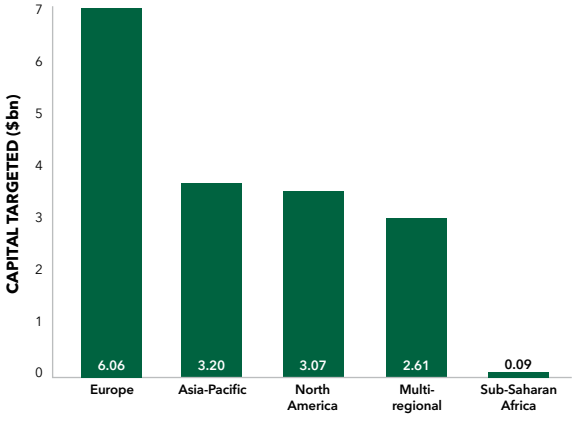
Top five renewables-focused closed infrastructure funds (2013-18)

Name	Head office	Fund manager	Current size ($bn)	Year close	Region
Copenhagen Infrastructure Partners III	Denmark	Copenhagen Infrastructure Partners	4.01	2018	Multi-regional
Powering Australian Renewables Fund	Australia	AGL Energy	2.23	2016	Asia-Pacific
Global Renewable Power Fund II	US	BlackRock	1.65	2017	Multi-regional
Offshore Wind Fund	UK	Green Investment Group	1.45	2017	Europe
Greater Manchester Pensions Fund – London Pension Fund Authority Renewable Fund	UK	Iona Capital	0.85	2015	Europe

Renewables-focused infrastructure fundraising statistics (2013-18)



Geographic focus of renewables-focused infrastructure funds in market, 1 January 2019



Top five renewables-focused infrastructure funds in market (1 January 2019)

Name	Head office	Fund manager	Target size ($bn)	Region
Greencoat Solar II	United Kingdom	Greencoat Capital	1.28	Europe
Aquila Energy Transition Infrastructure Fund	Germany	Aquila Capital	0.86	Europe
EFS Energy Japan Investment	United States	GE Energy Financial Services	0.68	Asia-Pacific
Foresight Energy Infrastructure Partners	United Kingdom	Foresight Group	0.64	North America
Green Growth Equity Fund (GGEF)	Singapore	Everstone Group	0.64	Asia-Pacific

Source: Infrastructure Investor

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Year in review

A look back at some notable quotes on the ups and downs in the energy transition, and the impact on infra investors, over the past 12 months

"People believe in the sanctity of PPAs. Most PPAs can't be broken, but they can be renegotiated"
Jeffrey Altman, senior advisor, Finadvice

"If there is no change, we can't build it"
Achim Berge Olsen, member of wpd's management board, on how Taiwan's FiT regime could stymie the proposed 350MW offshore wind project

"Renewables in Asia probably offer the biggest [investment] opportunity globally"
John Walker, vice chairman for Asia, Macquarie Capital

"The costs that would be incurred by consumers and taxpayers would be so much higher than alternative sources of low-carbon power, it would be irresponsible"
Greg Clark, UK business and energy secretary on the reasons why the government rejected the Swansea Tidal Lagoon project

"We cannot look at renewable energy in isolation, as a standalone asset on the energy grid"
Stephane Wattez-Richard, director, CONQUEST

"In places like Brazil, we have wind farms running net capacity factors of over 60 percent. So, you could easily produce two to three times the power you'd get from the same wind farm in Germany"
Adrian Mucalov, partner, infrastructure, Actis

"It's incredible the pace at which the European strategics have entered the local [Taiwanese] market"
Andrew Kwok, senior vice-president, private infrastructure, Asia, Partners Group

"Bioenergy, with its ability to deliver baseload power and ancillary benefits, is emerging as a flexible, competitive source of renewable super-infrastructure"
Gregory Smith, president and CEO, InstarAGF Asset Management

"In growth markets, it's about meeting the basic human need for power and getting new deployment and generation capacity in place"
Glen Matsumoto, head of infrastructure, Actis

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