

Renewable energy country attractiveness index

recai

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Issue 48

Fixing the wiring

As investors back renewable energy, the grids are struggling to cope

Cutting out the middle man

The challenges facing corporate PPAs

Time is money

Flexibility markets are allowing firms to time-shift their power needs

Oil, wind and sun

Saudi Arabia prepares for its first renewable energy tender

Green bonds: power surge



Building a better
working world



Fixing the wiring

If evidence were needed of the appetite investors currently have for renewable energy assets, it's to be found in the green bond market. Issuance is soaring this year, with green bond sales typically several times oversubscribed by investors hungry for yields from environmentally friendly assets.

As we describe in our cover feature, 65% of the proceeds of green bonds issued since the market's inception – or US\$95.6b – have been channeled to renewable energy. The green bond market has allowed corporates, banks and development finance institutions to tap into enormous latent demand among fixed income investors for clean energy projects.

Many of these projects, meanwhile, have been made possible by growing demand from companies for green power directly from the source. Corporate power purchase agreements (PPAs), typically transacted directly with renewable energy projects, allow companies to "green" their electricity supply, hedge against power price volatility and, in some cases, lock in attractive long-term savings compared to business-as-usual utility tariffs (see pages 8-9).

Corporate PPAs are a sign of the growing sophistication of large energy users. As we explore on pages 16-17, some corporate energy managers see an opportunity in finessing the timing of their power demand, shifting loads to off-peak times. With the increased penetration of renewables making grids harder to manage, transmission operators are developing incentives for consumers to reduce power demand (or supply generation capacity) on request. These capacity market incentives can be lucrative.

The appetite among many governments for renewable energy also remains undimmed, especially in faster-growing emerging markets. This edition of RECAI is peppered with news of renewable energy tenders, often breaking low-cost records, and usually attracting an overabundance of bidders. On pages 14-15, we report on Saudi Arabia's latest plans for its own tender program; we cover Chile's successes on page 18; and we offer an update on South Africa's initiative on page 19.

But, when it comes to grid capacity, all too often these successful tenders run into trouble. From China to Chile, via Germany, South Africa and many other jurisdictions, renewables have raced ahead of the capacity of the grid. Linking often remote project sites with demand centers, and managing the intermittency of wind and solar projects, requires substantial investment in transmission.

This is the new paradigm in which policy-setters must act.

Ben Warren
EY Global Power & Utilities Corporate Finance Leader

Renewables have raced ahead of the capacity of grids – and this requires substantial investment in transmission.



Green bonds: power surge

Green bonds, many focused on renewable energy, are being issued at record rates. As this largely unregulated market booms, we examine the risks faced by investors, and the need for a proper, detailed understanding of this fast-moving opportunity.

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Cutting out the middle man

Large businesses are increasingly looking to strike their own PPAs, to reach green goals as well as avoiding price volatility, but putting deals together can be complex.

Time is money

Grid operators and businesses both need to develop systems that allow energy use to be time-shifted.

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Oil, wind and sun

The oil-rich Kingdom is preparing its first renewable energy tender – to a tight and demanding schedule.

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Another auction saw record low prices – but also exposed the inadequacies of the country's power infrastructure.

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Debate about the country's energy mix leads to uncertainty for renewables.

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The green bond market powers up

The green bond market is helping to channel growing volumes of capital toward environmental infrastructure. But how do issuers access this financing, while addressing any investor concerns?

The green bond market is on a tear. In the first seven months of 2016, US\$48.2b of green bonds were sold by corporate, supranational, municipal and government issuers who promise to direct the proceeds toward environmental ends. That figure compares with US\$41.8b for the whole of 2015, up from US\$11.5b in 2013.

In most cases, these bonds offer the same yield as comparable conventional debt from the same issuers – all but guaranteeing that they will be snapped up by a growing cohort of institutional investors keen to add a green tinge to their bond portfolios, with no financial penalty, or who are attracted by the risk-return profiles of the underlying projects. But many investors remain on the sidelines, unaware of the benefits, or even concerned with the quality of some issuances in this new market.

With the exception of recent central bank guidance to Chinese issuers, the green bond market is as yet unregulated; it is up to the issuer to declare how the bond proceeds will be used, and up to the buyer to decide if they consider them sufficiently green. With initial issuance from supranational financial institutions such as the European Investment Bank and the World Bank, investors could be confident that green bond proceeds would be used appropriately; as the market broadens

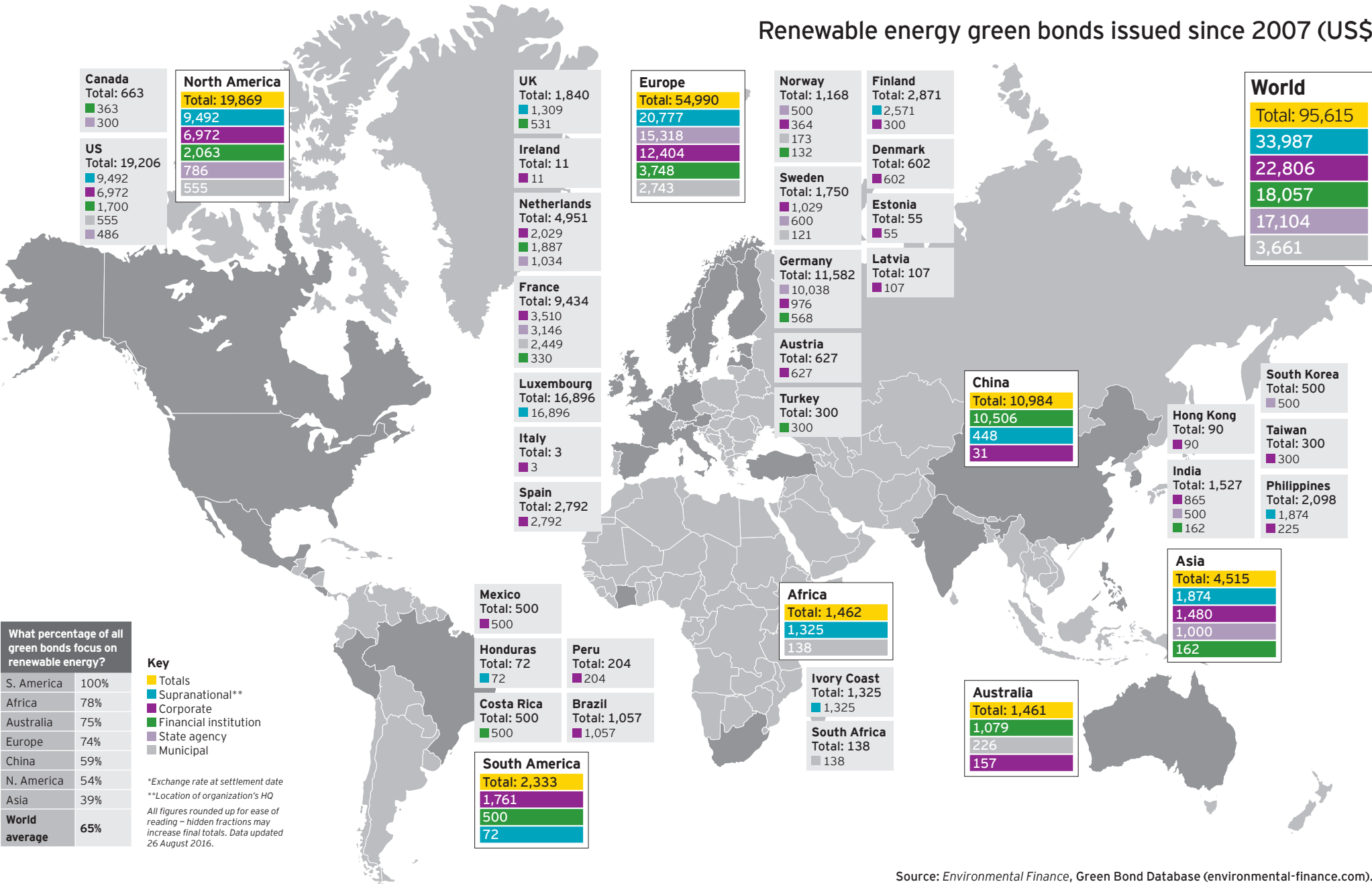
to less well-known names, the risk of greenwashing rises.

“There might be reputational benefits to buying green bonds, but there are also reputational risks,” says Manuel Lewin, the New York-based Head of Responsible Investment at Zurich Insurance Company, which had invested US\$1.2b in green bonds by mid-2016.

To add this sought-after integrity, the market has responded with voluntary initiatives; the Climate Bonds Initiative offers a certification program for bonds that meet its criteria. The Green Bond Principles, developed by green bond issuers, underwriters and investors, recommend transparency and disclosure by issuers, seeking to ensure the integrity of the market.

In and of themselves, these don’t always add the credibility to issuers, so many are now commissioning “second opinion

“There might be reputational benefits to buying green bonds, but there are also reputational risks.”



Source: Environmental Finance, Green Bond Database (environmental-finance.com).

providers” or traditional audit firms to provide a third-party assessment of each green bond they issue (see the box on page 7).

“These external stamps of approval provide crucial reassurance to bond buyers. But, ultimately, the investor needs to properly understand what it is investing in,” says Mathew Nelson, EY Asia-Pacific Climate Change and Sustainability Leader. “Investors need to know how to ask the right questions, to understand which criteria are applied to the bond, and to preferentially invest in those bonds where the criteria are properly applied and where independent assurance is provided.”

As might be expected, issuers provide plenty of information to potential investors

when they are marketing green bonds, but some market participants are concerned that this disclosure should also continue over the lifetime of the bond.

“One of the concerns in the market is that once a bond has become green-labeled, it’s in the universe indefinitely,” says Stuart Kinnersley, the CEO of Affirmative Investment Management, a London-based green bond asset manager. “What we aim to do is monitor the use of proceeds afterwards, to ensure the issuer does what it says it will do.”

Nelson notes that a growing number of issuers are paying attention to these concerns, and are commissioning auditors to review how the underlying assets are performing over the life of the bond. Such

reviews – conducted and published in line with the ISAE 3000 assurance standard – offer a higher degree of reassurance to investors, he believes.

Another potential problem for investors is a relative lack of supply; despite recent growth, green bond issuance accounts for a tiny fraction of the overall global bond market, which is worth an estimated US\$100t.

“The main problem is getting new green bonds into the market,” says Sean Kidney, CEO of the Climate Bonds Initiative. For all the growth in issuance, sales of new green bonds are typically heavily oversubscribed; this offers a marginal pricing advantage to issuers. Rather than having to price new issues at a slight premium to entice

For all the growth in issuance, sales of green bonds are typically heavily oversubscribed; this offers a marginal pricing advantage to issuers.

Feature: Green bonds

investors, organizations selling green bonds can often price them in line with existing debt.

Some research indicates that green bonds are commanding a price premium in the secondary market. According to Barclays, there is a 20 basis point spread in the yields of green bonds and comparable issues, as a result of strong demand from investors.¹

The reason for this supply and demand imbalance include the additional costs involved in structuring and issuing green bonds compared to conventional debt, and the fact that the world's capital markets are awash with liquidity, making it easy for issuers to raise funding.

Kidney also notes a relative lack of underlying green projects requiring financing, which he blames on inadequate policy support from governments. Meanwhile, on the demand side, many green bond investors either have explicit green bond mandates from their clients or have themselves publicly committed to support the market with green bond purchases, and therefore tend to buy and hold green bonds as they are issued. “The premium is still minor at this point,” says Kidney, “but if that changes, it will dampen the market.”

“If pricing goes much tighter than the regular bond, that would pose a challenge for new investors,” says Joop Hessels, head of green bonds at ABN AMRO in Amsterdam. They would be required to seek a specific mandate from their clients to pay a premium for green bonds, he says, and many would consider that to be a breach of their fiduciary responsibility to their ultimate beneficiaries.

New opportunities ahead

The relatively small size of the green bond market provides opportunities for issuers, however. “Much of the issuance to date has been from supranationals, utilities and financial issuers. This raises concentration risk,” says Hendrik Tuch, head of rates at Aegon Asset Management, an arm of the Dutch financial services group.

He also notes that most green bonds are at the high end of the credit spectrum, and are relatively short-dated, while many of his institutional clients favor longer-dated paper that better matches their liabilities.

This opens the market to new forms of bond issuance against green asset



Wind turbines being constructed at Kenya's Lake Turkana, supported by green bond financing

classes that tend to favor longer tenure of debt, such as more sustainable forms of transport and infrastructure.

Other analysts note that what is sometimes referred to as the “labeled” green bond market – i.e., those bonds where the issuer explicitly describes its bond as green – is only a subset of those bonds issued to finance environmentally friendly assets.

The Climate Bonds Initiative and HSBC track what they describe as “climate-aligned” bonds. They have identified a universe of US\$694b of bonds, two-thirds of which are issued by entities in the transportation sector. China Railway Corporation, for example, has issued US\$194b of bonds to finance the expansion of China’s high-speed rail network.

Investors also need to be aware that while underlying assets may meet “green” criteria, the bond proceeds are often used for refinancing, rather than for underwriting new assets. This can raise a concern for some about the “additionality” of the green bond market; is this simply a

rebadging of financial flows that would have happened anyway?

“A profound problem with the green bond market is the lack of additionality,” says Steve Waygood, Chief Responsible Investment Officer at London-based Aviva Investors, the asset management of the financial services firm. “Where is the new green infrastructure and renewable kit that has been financed with green bonds? Both investors and policymakers need to be aware that the vast majority is repackaging and refinancing existing projects.”

While this is true, Kidney is unconcerned, and says: “Bonds are not a project financing tool. What you use the bond market for is refinancing,” freeing up space on corporate balance sheets to allow new projects to be developed. What Kidney is more concerned about is governments stepping forward to bring new projects forward that they can then finance with green bonds.

Nelson has a more profound argument against those demanding that projects funded by green bonds be additional. “It

“The fundamentals of the green bond market are about financial return – otherwise, the danger is the market becomes part of the corporate responsibility agenda.”

isn't the responsibility of the green bond market to push down emissions – that's the responsibility of government policy,” he says. “The reason people should be investing in green bonds is because they see their potential for more attractive risk-adjusted returns over other debt instruments because the underlying assets will perform better in a low-carbon economy.

“The fundamentals of the green bond market are about financial return – otherwise, the danger is the market becomes part of the corporate responsibility agenda.” ■

Seeking reassurance: third-party approval

Issuers turn to a number of initiatives and approaches to reassure investors about the environmental credibility of their bonds issuers.

The Green Bond Principles were developed by a group of underwriters, issuers and investors, and are overseen by the International Capital Market Association. They provide general process guidelines that issuers should follow, and are widely used – 95% of green bonds reference them. However, they do not provide specific assurance to investors.

The Climate Bonds Standard offers sector-specific eligibility criteria for assets and projects that can qualify for green bonds certified by the Climate Bonds Initiative. Rigorous certification requires that underlying assets have corresponding methodologies for assessment. As a result, uptake is fairly limited, with only 22 bonds currently certified to the standard, but is expected to grow significantly.

Second opinions are provided by a number of organizations, including research institutions, certification companies and specialist environmental consultancies. They follow a range of methodologies to assess the credibility of an issuer’s claims.

Third-party assurance is available from accountancy organizations, including EY, providing audit-style opinions ahead of issuance and throughout the bond’s lifetime. If provided by accredited auditors, these audits will be carried out in line with industry standards dictating rigor and transparency.

Regulatory guidelines have been published by China and India. The former, from the central bank, specifies which assets can be financed by green bonds issuance. The Securities and Exchange Board of India, meanwhile, has taken an approach closer to the Green Bond Principles, focusing on process rather than prescribing project types.

¹ The Cost of Being Green, Barclays' U.S. Credit Focus, 18 September 2015.

Cutting out the middle man

Companies are increasingly striking power purchase agreements (PPAs) directly with renewables projects to meet sustainability goals and avoid power price volatility. But structuring deals isn't without its challenges.

For many large businesses, emissions from the electricity they use account for most of their climate impact – encouraging some to shun energy markets and instead contract to buy directly from clean power projects. By entering into PPAs, corporate giants such as Google, Walmart, Facebook and HSBC have helped create a new way of buying renewable power.

Although there were a few earlier deals, the market took off a few years ago in the US, and has grown rapidly. Some 3.2GW of corporate PPAs were signed in 2015 in the US alone, against 500MW in 2012 – and the approach has spread globally.

Typically, a company agrees to buy electricity from a specific renewables project for a fixed period, usually for a fixed price. The company ensures a certain amount of its electricity is green, and also hedges against volatile wholesale prices.

Project developers, meanwhile, secure a long-term power offtaker, and minimize their exposure to power markets. At a time when subsidies and government incentives for renewables are scarce, corporate PPAs can provide a predictable income stream against which developers can invest.

Some companies favor contracting with a single “flagship” project, rather than numerous small ones, to minimize transaction costs and due diligence, while others spread risk via a portfolio of smaller assets. They also tend to look to countries that do not offer fixed feed-in tariffs, where they would struggle to compete on pricing. So, geography is key to striking an attractive PPA – buyers seek countries that are attractive for renewable energy

projects, open to corporate PPAs and with high power needs to make the PPA viable.

European interest

While early PPAs were mostly struck in the US and Mexico, Europe is now taking notice. “Corporate PPAs are becoming increasingly common in Europe because of the shift away from government subsidies,” says Natasha Luther-Jones, Head of Renewable Energy, EMEA, at law firm DLA Piper. Early movers such as Sainsbury’s, McDonald’s and HSBC have been joined in the UK by Nestlé, Lloyds Banking Group and Nationwide. As Europe’s feed-in tariffs fall away, other countries are likely to see corporate PPA growth.

Emerging markets also present opportunities, as economic growth fuels power demand and governments embark on ambitious renewable energy tenders. “Multinational corporates sometimes have better credit ratings than local utilities,” says Phil Dominy, EY Assistant Director, Energy & Environmental Finance, making corporates more attractive counterparties for some developers.

But while corporate PPAs are penetrating new markets, US activity has slowed. According to the Denver-based Rocky Mountain Institute (RMI), just 590MW of corporate PPAs were struck in the year to 8 August, compared with 3.24GW in 2015. “In the US, power demand and wholesale prices have been declining,” says Dominy. “In addition, many projects and PPAs were brought forward into 2015 in order to qualify for an expiring federal incentive, the Renewable Energy Production Tax Credit, leading to many fewer projects in 2016.” But many see this as a short-term market correction, as project pipelines and power prices are forecast to gradually recover in coming years.

US-based projects still have attributes corporates seek when signing PPAs – they’re not backed by feed-in tariffs and tend to be larger than European projects. But structures are changing as the market evolves. For example, contracts are becoming shorter. A few years ago, many US corporate PPAs ran for 15 to 20 years. Now, most corporates don’t sign for much more than 10 years to avoid being tied into a fixed power price or one specific power source. Even-shorter PPAs, which track the market, are gaining popularity in competitive sectors like fast-moving consumer goods, which need to respond quickly to changes in power demand and market prices.

And US corporates are less willing to pay a premium over wholesale prices. In the past, they sought to hedge against power price rises, and some US corporate PPAs are in the red now compared with spot power prices. Hervé Touati, RMI Managing Director, says this has helped to trigger an evolution in contract terms: “Corporate renewable energy transactions are becoming more sophisticated, using hedging tools, such as collars and floors, to manage downside risk for the power offtaker.” Other buyers argue that now is the time to sign long-term, fixed-price electricity contracts, as wholesale electricity prices are at historically low levels in most of the US, he said.

But low wholesale prices can work against PPAs. As a Europe-based energy manager at a large US technology company argues, “If power prices are very low, we cannot justify paying a premium for renewable energy through a corporate PPA.”

For the corporate PPA momentum to continue – and for the US to pick up – more

companies need to adopt a long-term strategy for power purchases, say advisors. There might also be ways to mitigate pricing risks for corporates by looking at structures where the buyer and seller share the downside risk if power prices drop. Equally, discount-to-market pricing could become increasingly common if oil and gas prices continue to weigh on power markets.

Another way to entice more players into the corporate PPA space is highlighting the various buyer and offtaker structures available, as the “one project and one buyer” structure does not fit all types of corporates and generators. “If you’re a very large corporate and energy costs make up 40% of your total cost base, then you would prefer not to get all energy requirements from one project,” says Anna Nicols, EY Manager, Advisory, Energy Optimisation Practice. “Also, for heavy consumers of electricity, contracting to purchase all offtake from one project can have strong implications for balance sheet accounting.”

The same goes for owners of major renewables projects. They could secure multiple offtakers in order to hedge against the volatile nature of corporate electricity demand compared with that of a utility, and sometimes their projects are too large for a single corporate offtaker. A different issue has surfaced in Europe, where there

are fewer large-scale wind farms and solar parks than in the US. Luther-Jones says some developers of small renewables projects are evaluating the possibility of joining forces and grouping assets into a portfolio large enough to attract corporates.

The market could also expand if buyers relaxed requirements for PPAs to be “additional”, which is when projects are unlikely to have been built without the corporate PPA. While additionality is useful from a public relations perspective, there are also advantages in environmental terms in supporting existing projects to continue operating. Secondary PPAs can also help developers to sell projects, releasing capital to develop new additional projects. Indeed, with a growing number of buyers entering the market, it may not be possible to maintain an additionality-only approach.

And there are signs that the market is set for strong growth. Efforts such as the RE100 campaign encourage businesses to source 100% of their power from renewables. So far, 70 giants such as IKEA, AstraZeneca, The Coca-Cola Company and BMW have joined the initiative. With markets deregulating and renewables generators seeking alternatives to state subsidies, corporate PPAs are likely to become increasingly popular. ■

“Corporate renewable energy transactions are becoming more sophisticated, using hedging tools, such as collars and floors, to manage downside risk.”



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Case study: HSBC

Early initiatives by business to address their environmental impacts often involved buying carbon offsets from projects that reduce emissions. But when carbon markets were hit by reputational challenges, many firms sought new ways to go green.

This is what drove HSBC, in 2012, to set out an ambitious strategy to source its electricity from newly constructed additional renewable sources, says Alex Base, Global Head of Operational Sustainability at HSBC.

As part of a strategy to cut annual carbon emissions from 3.5 tonnes to 2.5 tonnes per employee by 2020, HSBC has a global target to source 25% of its electricity from off-site clean energy through PPAs. HSBC is now assessing how far it can increase the 25% target via more PPAs. In the UK it has by far surpassed its original target with 67% now from renewable PPAs. Globally, HSBC is at 17%, and plans to

extend to 100% in its largest markets.

HSBC focuses on mature technologies – onshore wind and solar – and has so far signed PPAs only where its commitment to purchase the electricity over the long term enables developers to raise the finance required to build the asset. The strategy focuses on those countries – the UK, the US, India, Mexico, Hong Kong and China – which account for most of HSBC’s energy demand.

Corporate PPAs also make financial sense, Base says. “We immediately benefited financially and are expecting to see good returns on our investment,” he says about the bank’s first PPAs in the UK and India.

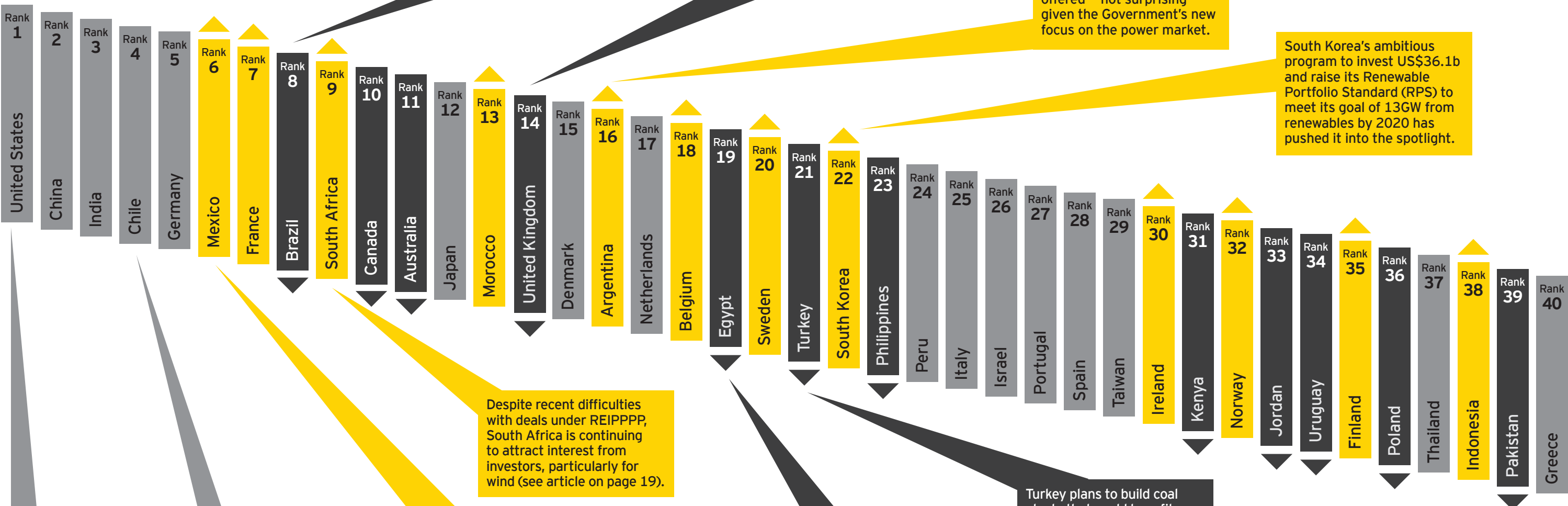
The bank is taking lessons learned from its early PPAs to established markets, like the US, and to emerging markets like Mexico. “We’re in the early stages of exploring opportunities in China and Hong Kong,” Base says.



HSBC's headquarters in Hong Kong

recal

October 2016



The impeachment of Dilma Rousseff has increased Brazil's market turmoil; and the new energy minister, Fernando Coelho Filho, may cancel the A-3 renewable auction due to lack of demand for power.

Uncertainty caused by Brexit, the closure of the Department of Energy & Climate Change and the approval of Hinkley Point C all dealt a sizeable blow to the UK renewables sector. Some respite came when the Government approved 1.8GW Hornsea 2, which will be the world's largest offshore wind farm if completed as planned.

Argentina successfully completed a recent auction that saw bids for more than six times the capacity offered – not surprising given the Government's new focus on the power market.

South Korea's ambitious program to invest US\$36.1b and raise its Renewable Portfolio Standard (RPS) to meet its goal of 13GW from renewables by 2020 has pushed it into the spotlight.

Despite recent difficulties with deals under REIPPPP, South Africa is continuing to attract interest from investors, particularly for wind (see article on page 19).

Mexico's second power auction exceeded expectations, with an average US\$33/MWh price, roughly 32% less than its first auction. Mexico has also committed to work with the US and Canada toward a goal of sourcing at least 50% of its electricity from clean sources by 2025.

Will the US hold its position at the top spot on our Index following presidential elections next month? Donald Trump has a poor record on climate change, which he has frequently dismissed as a "hoax," and threatens to pick apart the Paris climate accord should he be elected.

Chile's latest power auction achieved the lowest bids ever seen for renewables, at US\$29.1/MWh – but the Government needs to address transmission issues (see article on page 18).

Egypt's refusal to accept contracts that allow for international arbitration is discouraging investments in renewables.

Turkey plans to build coal plants that could benefit from subsidies and reduced environmental regulation. The failed coup in July further added to Turkey's woes; more recently, the country has been downgraded by Moody's to "junk" outlook.

Methodology

The index has been refreshed in 2016, with the measures driving all scores recalibrated to match the new reality of imminent grid parity. To see these measures and the background to our methodology please go to ey.com/recal.

Legend

- Increased attractiveness compared to previous index
- Decreased attractiveness compared to previous index



Theresa May, the UK's new Prime Minister

Brexit and Hinkley cast pall over UK renewables sector

The UK's renewables sector faces uncertainty following a summer and early autumn full of developments.

In June, the country voted to leave the European Union, which resulted in Theresa May becoming Prime Minister after David Cameron resigned.

The new administration gave Hinkley Point C nuclear power station the green light in September. Two months earlier, a Government reshuffle saw the closure of the Department of Energy & Climate Change (DECC), which was merged with the Department of Business, Innovation & Skills to create a new Department for Business, Energy & Industrial Strategy.

As a result, opposition politicians and some observers have raised concerns about the commitment of the new administration to climate policy and clean energy – although other observers welcomed the appointment of Greg Clark, a former shadow DECC minister, to run the new department.

These moves, coupled with the uncertainty caused by Brexit, have dealt a blow to the country's already floundering renewable energy sector and its attractiveness in the eyes of investors.

However, the continuing potential of UK offshore wind was illustrated in August with the formal approval of the 1.8GW Hornsea Project 2, under development by the Danish utility DONG Energy. If built as proposed, it

will be the world's largest offshore wind farm. The UK Crown Estate, which owns the UK's near shore, noted that offshore wind is now on course to supply 10% of the country's electricity demand by 2020. For comparison, Hinkley Point C, once it is operational in 2025, will supply 7% of the UK's power.

Despite this progress on offshore wind, the UK's renewables sector faces an unknown future as the country negotiates its future relationship with the EU, and May's new administration comes to grips with a power sector in turmoil. A huge bet has been made in relation to Hinkley Point C; a significant decision will be made on the future of tidal lagoon technologies in the coming months; yet for now the deepest and most easily deployable technologies of wind and solar seem to be absent from the Government's plans.

French tender plan to boost PV

France is to tender for 3GW of new solar PV capacity over the next three years. The Government is to hold a series of six tenders, for 500MW each, with the first tender to conclude on 1 February 2017, and the last round in June 2019.

Successful bidders will be paid a premium above the wholesale power price, while schemes run by cooperative and community groups will be eligible for additional tariff payments.

The tender program is intended to contribute to an increase in solar capacity in France from 6.7GW at present to 10.2GW by the end of 2018, and 18GW to 20GW by 2023.



Solar panels in the French countryside

Meanwhile, construction has begun on a factory that will produce solar panels to pave 1,000km of France's road network. The energy minister, Ségolène Royal, inaugurated the factory, in Normandy, being built by the DVD and PV panel maker Société Nouvelle Areacem. The company is due to produce some 5,000 square meters of crystalline silicon panels by the end of 2017.

Bids come in below forecast in Argentinian tender

Bidders offered wind power at an average price of US\$69.5/MWh, and solar at \$79.9/MWh, in Argentina's latest renewable energy tender, which is seeking 600MW of wind, 300MW of solar and 100MW of biomass, biogas and small hydro.

A total of 105 economic bids, for a total of 5.2GW of capacity, were offered. These were whittled down from 123 technical bids for 6.3GW.

Although prices offered are significantly higher than recent bids in the region (see the Chile article on page 18), they were marginally below the forecasts of Argentina's renewable energy association, CADER, and beneath the US\$82/MWh cap on wind projects and the US\$90/MWh solar cap.

This is the third stage of the tender program that began earlier this year, and which is intended to help Argentina meet targets of sourcing 8% of its power from renewables by 2017 and 20% by 2025. The winning bids were due to be announced on 7 October.

Indonesian president calls for 'aggressive' renewables drive

Indonesia should source 23% of its power from renewables by 2025, up from 18% at present, according to President Joko Widodo. Achieving that goal would require an additional 20GW of renewables capacity, and would help to meet 7% annual growth in power demand.

PLN, the state-owned power monopoly, is



An Iranian technician at the Kharg Island oil facility in the Gulf

Iran eyes renewable tariffs linked to oil price

Iran's energy minister has said the country plans to install 5GW of renewable energy over the next five years, with a further 2.5GW by 2030. Hamid Chitchian told Bloomberg that his ministry is already in talks with leading renewable energy firms, including Vestas and Siemens Wind Power, following the lifting of economic sanctions imposed as a result of Iran's nuclear program.

Iran is planning to tender for 1GW of wind capacity and up to 3GW of solar, as well as biomass and geothermal plants, he said, without providing dates. While the energy ministry already has a series of 12 feed-in tariffs in place for renewables plants of up to 100MW, it is planning a new support system, with a portion of the final tariff paid to projects linked to the price of oil.

While such a move might make sense for an oil and gas exporter such as Iran, whose revenues are closely correlated with the crude price, it is likely to raise eyebrows among solar and wind developers, who have no natural exposure to the price of oil.

The Government is planning investment of US\$50b over the next seven years in its power system, 80% of which comprises natural gas-fired capacity.

working to increase generating capacity by 35GW by the end of 2019, with coal slated to deliver 50% of this target, and natural gas 22%.

The energy ministry has targeted US\$1.3b of investment in renewables this year. US\$320m was invested in the first quarter, with most directed to biomass and geothermal projects.

Indonesia has some of the world's best geothermal resources, with an estimated 29,000MW of potential capacity. Despite this, 20% of its population of 250m has no access to the grid, and the country suffers frequently from blackouts.

Egypt wind and solar projects stalled over arbitration dispute

Projects looking to tap Egypt's feed-in tariff (FiT) program face delays over Cairo's refusal to allow international arbitration clauses to be included in contracts.

Some 39 developers had been attracted by FiTs of US\$0.136/kWh to US\$0.143/kWh unveiled in September 2014, but international development finance houses, which are helping to finance some of the projects, say none of the planned

developments satisfy their contractual requirements for arbitration in a neutral jurisdiction.

The Egyptian Government is targeting 2.3GW of solar and 2GW of wind within five years, and offered tariffs some observers believe are unsustainable, because of lower offers seen elsewhere in the region.

Developers are likely to reduce the size of projects, or delay moving ahead, but the impasse means that some may struggle to achieve financial close by October, as required.

More countries achieve no-fossil energy days

Portugal became the latest country to rely solely on renewables to meet power demand, running for four days in May without using any of its fossil fuel-fired generating capacity.

This feat pales beside Costa Rica, which – thanks to a large percentage of hydro in its generating fleet – ran on zero-emitting power for 76 consecutive days between June and August this year.

And, on one day last year, Denmark generated 140% of its electricity demand from wind, exporting the surplus to its neighbors.

Among large economies, however, only Germany has come close, briefly generating almost enough electricity to meet domestic demand one Sunday in May 2016.

Nordlink cable offers wind-hydro storage prospect

Work has begun on a US\$2.3b undersea connector linking Germany and Norway, offering the potential to store excess power from Germany's wind farms in Norwegian hydro plants.

The 387-mile cable will transmit up to 1.4GW of power, allowing Norway to sell its hydro power to Germany, as well as carrying surplus German wind power to pump water uphill to replenish Norway's hydro reservoirs. ■

Oil, wind and sun

Saudi Arabia has unveiled a breakneck plan to install 9.5GW of renewables by 2023 – meaning the Kingdom will have to build capacity rapidly if its goals are to be met.

The winds of change are blowing through Saudi Arabia. In April this year, Deputy Crown Prince Mohammed bin Salman al-Saud unveiled his ambitious *Vision 2030* plan to create an economy no longer dominated by oil. This “National Transformation Plan” contains a pledge to build 9.5GW of renewable power capacity, from almost nothing today. Since then, we have learned the target date – 2023 – and the mix of technologies sought for the first tenders (see table). The 3.4GW of tenders over the next three years make it the largest such program in the region.

The Kingdom has much to play for in pursuing its proposed renewables program, says Michelle Davies, Global Leader for Renewable Energy at legal advisors Eversheds: “With declining PV and wind costs, every country should be looking at renewables with strategic intent, no more so than in the Middle East, where rising demand for cheap energy and opportunities for economic diversification should be overwhelming.”

For all its ambition, the 9.5GW goal is a scaling down of plans announced in 2012 of building 54GW of renewables by 2032 – plans that were dropped. Observers blamed the number of ministries and agencies involved and the likely cost of subsidies.

“If Saudi is to take a leadership position in the region, and maximize the potential economic benefits of its ambitious program, the Kingdom needs to deliver this time round if it is to retain investor confidence at a time when other global opportunities are emerging,” Davies says.

David Lloyd, EY’s Middle East Transaction Advisory Service Power & Utilities Leader, detects firmer political will: “The rollout of the renewable energy program is part of the transformation plan – and anything in the transformation plan is mandated to happen.”

Indeed, the outlook for renewables projects in the region is more promising than in 2012. The cost of solar and wind power has plummeted, and experience in structuring and executing similar programs has grown. Saudi officials and advisers can learn from

numerous similar energy tenders, and there is strong interest from developers who did preparatory work for the earlier program. The Kingdom also has a successful track record with the independent power producer model of financing generating capacity, mostly from natural gas plants, to date.

But, with such an ambitious schedule, Rajeev Singh, EY’s MENA Transaction Advisory Service Leader, Infrastructure Advisory & Project Finance, warns that the Government needs to invest in significant capacity to manage the tender program if it is to be successful.

He is concerned that the agency responsible, the King Abdullah City for Atomic and Renewable Energy (K.A.CARE), could be overwhelmed in running the tender program proposed, given the number and complexity of decisions needing to be taken rapidly if the first tender is to take place next year, as planned: “K.A.CARE needs to ensure it has sufficient bandwidth to absorb large volumes of advice, process that information, take a point of view and get decisions from its top management. K.A.CARE will need to grow to a size where it has sufficient resources to manage the process. But the Kingdom is in a hurry ... and if you have empowered management, anything is possible.”

K.A.CARE is seeking advisors to help develop the program, and a request for proposals issued in June added more detail. But there are basic questions unanswered, such as on what basis power sales would be contracted, and whether through PPAs or feed-in tariffs. Also, while it is anticipated that developers would sell power to the recently established single-buyer entity – created as part of reforms to Saudi’s power market – it is not clear to whose credit risk developers would be exposed, Lloyd notes.

Of particular interest to bidders will be details of the “localization” requirements in the tenders. *Vision 2030* states that the Government will “seek to localize a significant portion of the renewable energy value chain in the Saudi economy, including research and development, and manufacturing.”

Such requirements are not unheard of in renewable energy tenders. The long-standing South African program stipulated bidders had to demonstrate that their bids met varying thresholds for local content as a percentage of project value – whether in terms of the equipment, construction or locally sourced finance, for example – to ensure that the program created domestic economic development and employment.

“My concern would be if there were very prescriptive, detailed, mandatory requirements for local content,” says Lloyd. Not only would creating a local supply chain from scratch add great complexity to the bidding process, it would also be challenging for K.A.CARE to assess the credibility of local content claims within bids.

It is also unclear whether bidders will be able to bring forward their own sites, or sites will instead be offered by K.A.CARE, says Jeffrey Gibbon, EY Assistant Director, Energy & Environmental Finance, one of the architects of the South Africa program.

“One possible approach would be for K.A.CARE to provide parcels of land upon which bidders can develop their projects,” Gibbon suggests. This ought to reduce site risk, but it should not be at the expense of optimal sites for renewables, he adds. Another concern is the grid’s capacity to take power from numerous projects – Gibbon notes the Government has expressed a desire to see projects developed across all parts of the country.

Another concern is whether K.A.CARE will

“K.A.CARE will need to grow to a size where it has sufficient resources to manage the project. But the Kingdom is in a hurry.”

have a monopoly. The Saudi Electricity Company is developing a handful of renewables projects, and some fear that the two programs could undermine each other. “One of the reasons that the renewable energy program in South Africa was so successful was because it was exclusively run by the Department of Energy. All the focus was on the single plan, and developers were keen to be involved,” says Gibbon.


For the tenders to be successful, K.A.CARE needs to develop a bidding process that is clear, transparent and in line with current practice, says Gibbon: “If you introduce non-market standard structures, create uncertainty over the bidding and evaluation approach, fail to provide clarity over what local content means or are ambiguous over site selection, developers will see risk in the process, competition will be reduced and tariffs will inevitably go up.”

However, with a clear, well-structured and market-standard program from K.A.CARE, which allows bidders to understand exactly what they’re bidding for, Gibbon concludes that “the scale of the plan provides KA-CARE with a chance to benefit from the downward trend in solar and wind tariffs.” ■


Saudi Arabia’s first renewables tenders (MW)

	2018	2019	2020
Solar (PV)	300	900	750
Wind	0	400	750
Solar (CSP)	0	0	300
Waste to Energy	0	0	50
Total	300	1,300	1,850

Source: K.A.CARE. Data points show when development is scheduled to start.



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Solar panels at the King Abdulaziz City of Sciences and Technology, Al-Oyeimah Research Station

Time is money

The decline of predictable baseload electricity supply is forcing grid operators to invest in creating greater flexibility on the demand side – presenting an opportunity for larger companies to deploy time-based energy management.

As renewable generation forms an increasingly large proportion of the grid mix, the importance of baseload technologies is declining. Greater volumes of renewable energy from intermittent sources means greater variability in supply, forcing transmission system operators to find greater flexibility in demand through time-based energy management.

Demand response offers the potential for energy users to save money and generate revenue. Grid operators are creating markets and incentives for companies to reduce demand at peak times or, in some cases, to commit to consume more power.

While many companies are developing power strategies based on energy efficiency and sourcing of renewable generation, few can effectively manage *when* they use energy. This represents a significant opportunity. For example, the UK’s National Grid aims to have 30% to 50% of balancing services provided by demand response by 2020, equating to £300m to £500m (US\$390m to US\$649m) each year that it will direct to businesses providing demand response services rather than traditional large generators.

In addition to this potential revenue stream, companies that can manage when they need power can avoid peak charges. The combination can take up to 10% off the total energy bill; for a business spending US\$100m on energy, a US\$10m saving could drive significant uplift in earnings. Such savings should catch the CFO’s eye.

However, the time dimension of energy management is complex. A lack of clear and reliable information about demand response opportunities can make time-based energy management seem complicated. In a survey by *The Energyst*,¹ 25% of companies say they don’t understand enough about the market – and the options available – to participate in demand response, while 46%

consider their equipment and/or processes as not suitable, most likely because of a perceived risk to operations.

The director of sustainability at international telecoms and television company Liberty Global notes that: “Operational set-ups are different in many regions, and therefore a good amount of prework is required before deploying such initiatives. It is crucial to engage with multiple internal stakeholders who each understand their area of operational responsibility the best in order to identify the specific risks and opportunities ... we must ensure that demand response doesn’t come at the cost of reliability of service to our customers.”

Such concerns are understandable. However, in many cases, they can easily be addressed and risks managed. The first step is in understanding what markets and mechanisms are available.

Peak avoidance

Many companies have started to participate in demand response via peak avoidance mechanisms, such as “Triad avoidance” in the UK – reducing electricity use during the three half-hour settlement periods with highest system demand. This is a simple way to get a significant reduction in transmission charges, by shifting energy use away from the winter peaks.

However, as more companies become involved in such mechanisms, they become more complex to exploit. Triads are becoming increasingly difficult to predict as greater volumes of demand are shifted in anticipation. So, while peak avoidance techniques are a good starting point, other demand-side response mechanisms are likely to offer more reliable, longer-term savings.

A growing number of grid operators have introduced markets or incentives for energy users to provide capacity or flexibility. In the UK, National Grid operates two markets in

addition to the electricity market:

- ▶ The capacity market, which allows the grid operator to buy additional electricity capacity for times of peak stress, either from operators who agree to bring generating capacity online, or from users reducing their demand.
- ▶ The flexibility market, which sees energy users selling availability at certain times of the day. It allows National Grid to call for reductions in usage or increases in generation at reasonably short notice.

These approaches are not unique to the UK (see table). In the United States a capacity market is in operation within the Pennsylvania-Jersey-Maryland (PJM) grid, which serves 13 states. Germany is conducting a tendering process for 4.4GW of capacity plants; and there are plans for old generation plants, with a total capacity of 2.7GW, to go on “security standby” for four years and used in extreme cases. Germany is also developing a flexibility market. So is France, whose “ÉcoWatt” initiative alerts consumers to winter peaks via email or SMS in regions where supply is unreliable, such as Brittany. Other countries in Asia and the Middle East are assessing similar mechanisms.

Many larger companies are looking to develop global energy strategies. Demand response is an opportunity for optimization across multiple markets. However, proliferating different demand-side response programs and mechanisms, and the complexities involved, can present a barrier for corporates. Automatic and remote control of industrial processes, and even process-critical lighting or HVAC systems, can be intimidating.

As Liberty Global’s sustainability director says: “You have to be careful not to generalize the benefits as these are not the same in all countries at the moment.



National Grid electricity transmission control centre

However, this may change over time and more countries will offer benefits.” Nonetheless, involvement in demand response at this stage allows corporates to start to optimize their operations and evolve practices slowly over time toward a smart energy market that responds instantaneously to price signals, rather than being penalized for lacking flexibility when this becomes the norm.

Companies concerned about the operational risks involved in better managing their demand might also consider exploring large-scale electricity storage, a technology that will also transform the workings of the grid. Large battery storage units could enable surplus generation to be stored and used when needed, or exported to the grid at times of peak demand. As the cost of the technology continues to fall, this appears as a promising opportunity for balancing schemes as it is extremely

responsive (battery storage has the ability to respond in under one second) and can be paired with renewable generation.

To enable companies to participate in demand response in a way that suits the needs of their business operations, the complexities of demand response need to be broken down and a clear business case developed. Participation in demand response could require little or no investment thanks to existing assets being suitable for some demand mechanisms; and while the CFO may question the operational risks, experience shows that demand response can be a minimally invasive scheme if the mapping of the operational characteristics and the opportunities are both carried out correctly. The amount of investment promised by the UK’s National Grid is just one indication of the value on offer for companies able to master time-based energy management. ■

“We must ensure that demand response doesn’t come at the cost of reliability of service to our customers.”



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Examples of capacity and flexibility markets in various countries

Countries	Main operators	Capacity market	Flexibility market
US	▶ PJM Interconnection ▶ Grids differ by state	▶ Energy procurement ▶ Usage estimations – three years in advance	▶ Exist in a number of states – California is the most active ▶ 90% of flexibility customers are residential
UK	▶ National Grid ▶ Distribution network operators (DNOs)	▶ First delivery year: brought forward to 2017 ▶ T-4 pay-as-cleared auction with ~1% of reserve requirement held for T-1 auction	▶ Peak avoidance ▶ Fast response ▶ Frequency response ▶ Short-term operating reserve (STOR) ▶ Demand-side balancing reserve (DSBR) ▶ Frequency control by demand management (FCDM)
Germany	▶ Transmission system operators (TSOs), e.g., Amprion	▶ Power reserve ▶ Standby lignite plants	▶ Primary control reserve ▶ Secondary control reserve ▶ Minute reserve
France	▶ Réseau de Transport d’Électricité (RTE) ▶ Distribution system operators (DSOs)	▶ Energy procurement	▶ ÉcoWatt ▶ Demand-side management
Russia	▶ TSOs e.g., FGC UES	▶ Payments to generators since 2011	
Australia	▶ TSOs e.g., TransGrid	▶ Reserve capacity mechanism	▶ Trials

¹ “Demand Side Response: Bringing businesses into balancing – 2015 Report.” *The Energyst*, theenergyst.com/wp-content/uploads/2015/08/Demand-Side-Response-report-2015.pdf

Soaring generation seeks joined-up grid



Downtown Santiago

Another record was set in August in the seemingly inexorable fall in the cost of electricity from solar photovoltaics. Chile's latest power tender, dominated by renewable energy technologies, saw a bid at US\$29.1/MWh from the 120MW Granja Solar plant, to be developed by Spain's Solarpark. This beat the US\$29.9/MWh bid in a tender in the United Arab Emirates in May.

In the Chilean tender, renewables projects won contracts to supply 52% of the total 12,430GWh sought by 2021, with wind taking 40% and solar 12%. Eighty-four companies bid in the auction, the highest since the system was introduced in 2006, offering seven times the volume required. And, at an average rate of US\$47.6/MWh, was well below the US\$79.3/MWh average of the previous tender, last October.

Endesa, a subsidiary of Enel, dominated the tender, accounting for 47% of total volume, across renewables, hydro and thermal power plants. Ireland-based Mainstream Renewable Power won a further 30%, via seven new wind farms across the country with a combined capacity of 985MW.

There is considerably more to come. The Comisión Nacional de Energía (CNE) has announced plans to hold three more auctions in the next two years, with a view to sourcing 19,900GWh of supply. Bloomberg New Energy Finance forecasts that at least 4.7GW of renewables capacity will be developed in Chile in the next three years.

This comes after several years of impressive growth. In 2011, renewables accounted for just 1% of Chile's installed capacity – by the end of 2015, this figure had risen to almost 12%, with 2.5GW of capacity. A 2013 bill targets 20% of the country's electricity supply to come from renewables by 2025;

the country's 2016 energy strategy envisages renewables supplying 70% of the country's power by 2050.

However, for all the success seen to date, Chile's market faces a number of issues that need to be addressed if some of that investment is not to be put at risk. The biggest is fixing inadequacies in the transmission system that, alongside the economic slowdown, have pushed down wholesale power prices in some parts of the country to unsustainable levels.

The fundamental problem with Chile's transmission system is that it comprises four unconnected power networks with various internal bottlenecks. Much of the country's solar capacity is in the northern section of the Sistema Interconectado Central (SIC), while 90% of the population and the majority of its industry is in the central region further south, separated by a bottleneck in transmission capacity within the SIC itself.

These problems have been exacerbated by the economic slowdown caused by the end of the China-fueled commodities boom. Chile is the world's largest copper producer, and the languishing copper price has hit the mining sector, reducing power demand.

The result has been plunging wholesale power prices, which have fallen from an average of around US\$130/MWh in 2014 to US\$80 last year. Even more problematic is the fact that transmission bottlenecks mean the increasingly available renewable energy regularly has no route to market, resulting in spot prices around parts of the country's networks hitting zero on many days.

The Government is moving to address transmission constraints; in July, legislation was passed that will enable more effective long-term planning, allow for grid expansion,

The problem for Chile is that its four power networks have inadequate connections.

guarantee open access to the grid and create a single independent grid operator, among other things.

It is also building a transmission line linking the central SIC and northern Sistema Interconectado del Norte Grande (SING) systems, due to be completed in early 2018, while a project to alleviate the SIC bottleneck via an expansion of the Cardones-Polpaico line is currently underway. However, these projects alone will not be sufficient to make Chile's electricity grid fit for purpose. To that end, the Government is to launch a feasibility study to construct three new transmission lines connecting its power market to Argentina's. A 70km, 300MW capacity transmission line between the northern city of Arica and Tacna in Peru has also been proposed, but is awaiting political sign-off from the two countries.

While the current macroeconomic outlook is not as positive as it has been in recent years, continued growth in GDP and power demand is forecast. The question for prospective investors and developers is whether the Chilean Government can move fast enough to ease the country's transmission constraints. ■

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Uncertain times for Africa's energy star



Cape Town and Table Mountain

South Africa's enormously successful renewable energy tender program put the country at number one in Africa last year in terms of asset finance for utility-scale projects, with US\$4.5b of transactions.

Since 2011, the Department of Energy in South Africa has run four tenders through its Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), towards its target of 17.8GW of renewables by 2030. To date, the program has attracted around US\$16b of investment into 90 projects.

Tenders via REIPPPP involve winning developers signing PPAs with Eskom, the state-owned electricity utility. In July, the company said that it has contracted with 3.9GW of renewable independent power producer (IPP) capacity, of which 2.1GW has been connected to the grid.

According to figures from GlobalData, wind capacity rose from almost nothing in 2012 to 1.13GW by the end of 2015. It projects that a total of 5.6GW of wind will be installed by 2020. And, according to data from GTM Research, solar PV reached 1.64GW by 2015, with 3.4GW additional capacity expected before 2020.

But, amid transmission constraints, new baseload generation plants currently under construction and a debate within the country about how best to achieve an appropriate energy mix for the country, the market perceives that the outlook for South African renewables has become less certain.

In particular, Eskom is seeking clarity from the Government over future tenders. A company spokesman told Bloomberg News

in August that it wants to discuss the program with the Department of Energy before signing further contracts with renewable energy developers, noting that it has sufficient power capacity to meet demand, and that consumers would bear the costs of additional purchases.

It follows a postponement in signing a PPA with a successful bidder, the 100MW concentrating solar power Redstone Solar Thermal Power Project, under development by ACWA Power and SolarReserve.

Eskom has blamed the delay on "conditions precedent not being met," while a spokeswoman for SolarReserve said that the postponement was the result of outstanding documentation.

Eskom has denied that it plans to put existing bids on ice – it expects a further 1.03GW from the program to be commissioned during 2016 and 2017, including 504MW wind, 510MW solar PV, 4MW hydro and 11MW landfill gas. Meanwhile, the Minister of Energy has confirmed continuing Government support for the REIPPPP.

The Government is also working to address transmission challenges faced by renewable energy projects. In February, the Cabinet announced that plans to introduce Renewable Energy Development Zones (REDZ) for wind and solar projects would be published in the official gazette. The proposal would involve the creation of eight zones, linked by five power corridors, which would be targeted for grid investment.

Projects within these zones would be fast-tracked, with streamlined regulatory approval processes that could see the time

required for authorization cut in half. However, developers of projects already underway outside these zones are concerned that their projects may lose out.

The Department of Energy has embarked on a broadening of the country's energy mix, announcing a program to procure 3.7GW of gas-fired generation, and procurement documentation is under development. This is in addition to the Coal Baseload IPP Procurement Programme window 1, in which two projects, with 863MW of capacity, were selected in October. The Government has also announced the imminent release of procurement documentation for its nuclear program.

These developments raise questions in the minds of developers over prospects for investment in utility-scale renewables under REIPPPP. However, as the electricity supply markets in South Africa and elsewhere in Africa develop, the need to find fit-for-purpose solutions is gaining much needed attention.

Opportunities exist in rooftop solar for either residential or corporate customers. According to calculations from the Pretoria-based Council for Scientific and Industrial Research, power generated by residential solar PV systems is currently cost-competitive with utility tariffs, and the economics are moving in a positive direction. ■

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