

Renewable energy country attractiveness index

recai

May 2016
Issue 47

From pledges to profits

Making the most of emerging country opportunities post-Paris

Out with the old ...

Our refreshed index sees Europe falling behind while emerging markets surge

Argentina's time to shine

The new pro-market government reveals its ambitious renewable energy plan

What happens when grid parity hits?



Building a better
working world



“There is nowhere to hide for those markets or companies who don’t deliver ...”

The final frontier

Macro fundamentals. Energy imperative. Policy enablement. Project delivery. Technology potential. The five pillars of attractiveness in our refreshed RECAI, and the key drivers of deployment and investment opportunities in a new world order where renewable energy has moved beyond decarbonization. It is, quite simply, what makes most sense.

As such, we are now in an era where policymakers and regulators must shift their focus on market access and fair play; where technology improvements and costs curves will lead to a level of renewables deployment not even imagined; where developers and independent power producers become energy services companies and value chains and business models are stretched; and, finally, where a rethink is necessary in the way capital flows around the globe to fuel the unstoppable move toward decarbonized generation. As the renewables industry gets more comfortable with taking and managing risks in ever more diverse markets, our index now reflects the truly global nature of our businesses.

However, while this new norm is generating daily headlines about multi-GW renewables targets, record low wind and solar prices, and an ever-growing investor base, the ability to climb the index – or remain in it at all – will depend on both industry and policymakers delivering results, not just promises. Tendered capacity must be converted into assets in the ground, and commercial viability must enable supply and demand to interact freely in the market.

The march toward universal grid parity will also undoubtedly change the technologic, economic and regulatory landscape in ways that few actors fully appreciate, something we explore in this issue. It’s hard to imagine, a decade ago, the boss of a major grid operating company celebrating innovation and risk taking, seeing market disruption as a blessing, not a curse (see page 7).

But there are still those that need to get with the program – some utilities are, sometimes with the help of their regulators, trying to hold back the tide. Instead, they need to start swimming, or they will struggle to stay afloat.

After all, with 195 countries globally, renewable energy attractiveness will always be relative now that the fundamentals of security, sustainability and affordability rule the day.

We have reached the final frontier, and there is nowhere to hide for those markets or companies who don’t deliver – developers and investors will simply go elsewhere.

A handwritten signature in black ink, appearing to read 'Ben Warren'.

Ben Warren

EY Global Power & Utilities Corporate Finance Leader



What happens when grid parity hits?

Amid record low prices for renewables, we look at the impacts on policymakers, regulators and utilities that will be caused by grid parity

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From pledges to profits

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Preparing for parity

As solar, wind and storage technologies continue their remorseless – if not breathtaking – decline in cost, grid parity is set to wreak havoc on the century-old utility business model.



Wind turbines and pylons in Pozuelo de Aragón, Spain

Aspecter is haunting electric utilities and their regulators – the specter of consumers being able to generate their own electricity at the same or lower cost than what they are paying to purchase electricity from the grid.

Renewable energy advocates have long warned that grid parity – once it arrives – will transform the relationships between consumers and utilities, and the power markets in which they operate. But, despite these warnings, few utilities, regulators or policymakers have fully appreciated just how rapid and far-reaching this technological revolution will prove. Many have avoided engaging with this impending transformation, putting it into the “too hard,” “not our business” or “irrelevant” categories.

Once it becomes economic over the long term to install renewable energy and storage technology without subsidies, uptake will accelerate beyond the control of incumbents and the authorities as the free market takes over. This will have profound implications for electricity markets around the world.

“Grid parity” can be an imprecise concept and varies from market to market, depending on the context in which it is used. Retail prices, installation costs, financing costs and yield can vary widely by technology choice, region and market. However, the economic case for consumers to have embedded energy generation and storage has been accelerating and is likely to reach a tipping point in the coming years. This march toward consumer-driven grid parity can be slowed by incumbent resistance and regulatory intervention – but not, we would argue, stopped.

The initial grid parity point is where renewable energy generation can produce

electricity at a price equal to what the consumer, be they retail or corporate, is paying their utility.

An inflection point has already been reached in some markets, such as South Africa, Chile and Mexico, where utility-scale renewable energy generators can output electricity to the grid at a more competitive price than large thermal generation. Moving this technological advantage downstream and closer to the energy consumer is, perhaps, inevitable.

A recent report from Deutsche Bank suggested that Australia is likely to be one of the first countries to reach an unsubsidized grid-parity tipping point for residential consumers. It estimates that, in 2017, the levelized cost of energy from solar will be US\$0.14/kWh, against residential prices in the US\$0.27 to US\$0.57 range. In the Philippines, the lack of a national grid adds US\$0.14/kWh in transmission costs on top of the US\$0.12/kWh costs of coal-fired power. With a levelized cost of US\$0.10, solar again looks attractive.

In most cases, these vanguard projects or markets benefit from a combination of factors: a proprietary technology, some financing or structuring innovation, high existing electricity prices (i.e., dependent on oil or diesel), or a particularly rich renewable resource. Over time, these technology and structuring advantages will become more widely disseminated, and improvements in efficiency will allow renewable energy technologies at the distribution level to be more cost-effective and deployed at scale.

Assessing the impacts

The good news is that grid parity will see low-carbon, distributed power generation technology penetrate rapidly, leading to faster reductions in greenhouse gas emissions and local air pollution. With zero fuel costs, negligible marginal cost and predictable operating expenses, these technologies promise cheaper and more stable long-term prices than are currently available from the wholesale electricity market.

But the impacts will also be disruptive. There will be less load required from conventional thermal generation, as already witnessed in markets with high renewable energy penetration. Wholesale power prices will fall in the face of declining demand and will be inversely correlated to output from renewable generators. In

markets awash with cheap oil and gas, only the cheapest fossil plants will survive, with increasing demand for flexible generation and decreasing demand for baseload generation.

Managing the transmission and distribution grid will become more challenging. Few consumers are likely to defect entirely from the grid, even with cost-effective on-site storage. Domestic systems that have no dependency on a grid connection are likely to remain prohibitively expensive for some years, with the grid providing balancing services when supply and demand need to match. The growth of unsynchronized generation will result in excess solar supply during peak summer months and excess wind energy at times of low demand. This means transmission and distribution grids – and the rules governing them – will need to be strengthened, and designed to accommodate this additional generation and ensure long-term stability. And the costs of having spare generation capacity on hand when renewable resources cannot meet demand will have to be met by consumers.

The magnitude of these impacts, and the speed at which they evolve, will be largely beyond the control of policymakers, regulators and utilities. Once renewable energy generation is fully cost-competitive without subsidy, its growth is likely to be exponential as private capital, innovation and consumer demand take over. Regulatory interventions may happen, either to protect investors in conventional assets or to ensure market stability; but these are unlikely to slow down the pace of growth for long.

The implications for incumbents, grid operators, regulators and new entrants will be profound.

For incumbents, the choice is between clinging to outmoded business models and waiting for their inevitable demise – or, most likely, shifting toward a broader provision of energy services, perhaps as installers, asset managers and even owners of distributed renewable generation and storage solutions. Some jurisdictions will see utilities essentially become open platforms that facilitate the provision of energy services to their customers by third parties.

Grid operators, meanwhile, will also face a new world, with less emphasis on their role in distributing power and more on balancing complex, decentralized networks →

Tender bids plummet

With a growing number of jurisdictions contracting utility-scale renewable energy through competitive auction processes, renewable energy is increasingly proving its mettle against conventional energy generation.

The results from Mexico's tender in March are a case in point (see page 19). Bid prices came in between US\$35/MWh and US\$68/MWh, for 5.4TWh of energy spread across 16 projects with a total capacity of just over 2GW. The lowest was \$35.44/MWh from Enel Green Power, for a 330MW solar project, setting a new low for solar. Wind prices were higher, averaging US\$55/MWh, in line with current wholesale prices in the market.

Mexico fits the pattern of other recent tenders. In October, Morocco tendered 850MW of wind energy projects. The country's energy minister, Abderrahim El Hafidi, revealed that bids averaged US\$30/MWh, with the lowest at US\$25. He did not identify the cheapest project, but Enel Green Power, again, has reportedly claimed the lowest bid, without disclosing a figure. Renewable energy auctions in India, South Africa and Peru all saw bids that fossil generators would struggle to match.

Some observers question whether the lowest-priced of these projects will ever be built, or suggest developers may be buying market share with loss-leading or merely break-even projects.

Regardless, they confirm the falling cost of renewables and their growing ability to challenge and displace fossil fuel generation without subsidy, once long-term power purchase agreements (PPAs) from creditworthy counterparties are an option in any market.



Moroccan wind farm



Photovoltaic panels, Spain

Spain 'heading for parity'

Spain's once vibrant solar market is a vivid illustration of what happens when subsidies disappear, as they did in 2011. Just 45MW was added last year to Spain's 4.8GW of solar PV, according to the International Renewable Energy Agency (IRENA).

But UK-based developer Hive Energy is confident that its pipeline of 300MW of solar PV projects in Spain can proceed without the need for subsidies – which currently account for around 90% of PV project revenues in the country.

Lots of sunshine and power prices that are likely to rise will make Spain the first country in Europe to reach grid parity, says Luis Martinez Hermida, Hive's General Manager for Spain. "As of today, we don't have grid parity but, within a couple of years, we'll be ready to go."

With capex of €750,000/MW (US\$848,000), and 50/50 debt/equity, Hive can deliver internal rates of return of 8.5% to 9%, Hermida says. The plan is to flip projects at the construction phase to funds that are happy to finance and construct projects. While Hive's projects are profitable at wholesale prices of €60/MWh (US\$68), investors won't finance based on the electricity pool price, given its volatility. To develop projects, Hive will either need to negotiate PPAs with creditworthy off-takers, or enter into a swap with a bank that is willing to take pool price risk – which at present is a pricey option. "We're working on both avenues," Hermida says.

There is no particular secret to developing unsubsidized projects, he maintains: "It's about the evolution of the market, and believing in the story. The market will come, and hopefully we can make it work."

with ever-changing supply and demand profiles. They will need to adapt to new approaches to network pricing, away from volume-based charges toward a recognition of the value of access to the grid for balancing intermittent renewables, not dissimilar to incentivizing generators to be available just on demand.

Regulators and policymakers will face challenges in managing the transition from centralized to decentralized power systems. They will need to ensure that the information technology required to monitor and control distributed generation is standardized. They will face particular challenges in aligning the interests of incumbent utilities and grid operators with those of consumers who recognize the benefit of embedded renewable energy generation.

The response will require a degree of flexibility and agility that is likely to be alien to regulators, who have thus far been required to deliver security of supply above all else. There will also be a need to incentivize solutions that enhance grid stability, including frequency and voltage response, storage and reactive power.

All the above presents a range of opportunities for "challengers," whether as equipment manufacturers, installers, aggregators or intermediaries helping consumers effectively trade power with the grid. An enormous opportunity exists to finance and deploy new technology applications and business models.

As for consumers, both large and small, they stand to benefit: from reductions in what they pay for their power, from potentially less volatile power prices, and from reductions in their carbon footprints.

Heel-draggers and pioneers

But while we believe the economics of grid parity will ultimately win out, resistance from incumbent utilities or heavy-handed regulation can slow uptake significantly.

In both developed and developing countries, utilities have clung to outdated business models and have been on the wrong end of the spectrum with respect to renewable energy growth, suffering as a consequence. State-owned power monopolies such as Mexico's CFE and Eskom in South Africa have only recently opened their markets to renewable energy tenders. The big utilities in Japan have denied grid access to solar farms. And Nevada's utility, NV Energy, has recently

won what is likely to be a Pyrrhic victory against its own ratepayers over grid connection charges for solar generation.

Which countries and jurisdictions are likely to move most swiftly toward grid parity?

Those with power markets that are not dominated by monopoly incumbents, where consumers already have a choice of suppliers. Those with high levels of renewable resource. And those which benefit from regulators and policymakers who understand that their role is to enable and smooth the transition away from centralized, largely fossil-fuel power markets, rather than to erect obstacles.

The renewable energy industry and its advocates, meanwhile, also need to understand the opportunities and challenges that subsidy-free markets present.

Without doubt, the right policies and subsidies have served their purpose in enabling technological advances and in creating economies of scale.

Now that renewable energy has reached maturity and has become cost competitive, the focus needs to move away from a take-or-pay environment to one where all other services required to enable high-penetration renewable energy are both required and remunerated – namely flexible capacity, ancillary services, demand-side management and grid stability. These require a fresh emphasis on other, supporting technologies: advanced energy storage, load management and smart distribution.

Up until now, the big question has been whether renewable energy technology can compete fairly against thermal generation. That question has been answered – and, indeed, improvements in technology and efficiency are headed only one way.

With grid parity just around the corner, there are new big questions to be answered.

How long will it take for policymakers, regulators and utilities to adapt to the new energy reality? How long will it take for the grid to be made fit for its new purpose – to cope with and maximize the benefit of the world's most reliable, long-term energy resource?

And, critically, who will end up seizing the vast opportunities that this seismic shift is creating? ■

Holliday: 'There's a whole new market evolving'



Steve Holliday, outgoing CEO of National Grid

The business of moving electrons from A to B is being transformed. The modern electric grid is becoming "super-smart and extraordinarily flexible," says Steve Holliday, who this March stepped down as CEO of National Grid, the company which, among other things, operates Great Britain's power transmission network, and which owns gas and power businesses on the US east coast.

The reason is obvious: when Holliday joined the company 15 years ago, 87% of the UK's power was generated by just 50 large power plants. Last year, that had fallen to 55%, with some 955 wind farms and more than 800,000 solar installations supplying power to the grid.

Holliday notes that the falling cost of power storage provides "an enormous opportunity" to overcome issues associated with such a volume of intermittent generation. However, doing so efficiently, and at low cost to the consumer, presents substantial challenges for an organization created for a very different time. "The industry grew up thinking about the supply side and never really managing the demand side of the equation," Holliday says.

National Grid has been investing heavily in demand-side response – paying large consumers to dial-down their power use in times of system strain, and by doing so reducing overall costs to consumers. It recently launched an auction process for so-called "response flexibility," for which 72 generators, aggregators and storage companies, representing more than 1,370MW of capacity, have prequalified to offer 200MW of frequency response services over the next winter.

Not only will some of those bidders offer to reduce power demand at times of system stress, but some will, for the first time,

"We have had to learn to reward innovation and risk-taking, and become comfortable with a degree of ambiguity."

offer to consume more power if required to help balance the grid cost-effectively. "If we can get people to increase demand at these times, we can bring down costs for consumers," says Holliday. He notes that the issue is not only that renewable energy might be selling power into the grid at zero marginal cost; by creating capacity constraints in times of high supply and low demand, this power actually carries a negative cost.

"There's a whole new market evolving – it will help us smooth the demand curve and will reduce the overall investments required to manage the system in its entirety. It's a very exciting new world," he says.

The changes to power systems wrought by renewable energy and smart technologies are also changing the nature of National Grid, says Holliday. "The industry has traditionally been very risk averse. We have had to learn to reward innovation and risk-taking, where appropriate, and become comfortable with a much greater degree of ambiguity."

The brave new world in which National Grid now operates also calls for regulatory agility, Holliday argues. "Historically, policy and regulation has been developed based on extensive consultation and exhaustive analysis," he says. In today's market, the speed of technological and business model innovation means that, "by the time you've finished the process, it's out of date."

He cites the willingness of UK regulators to make changes to the recently introduced Capacity Market, and the success in developing storage in the US Pennsylvania-New Jersey-Maryland power market, despite near-annual change to the market rules. "It sounds unstable, but it's led to more storage being invested in their territory than anywhere else."

Holliday says investors accept that policy needs to evolve, but want to see a transparent process. "We need predictable flexibility," he says. Ultimately, Holliday believes that the answer is for regulators to set the direction of travel, but to be prepared to refine regulations as facts on the ground change.

From pledges to profits

Climate finance may have been key to securing the breakthrough climate agreement but, for developers on the ground, what has changed since Paris? The answer lies in emerging market opportunities.

In the run up to last December's Paris climate talks, observers were almost unanimous; it would be promises of climate finance that would clinch the deal. Without substantial pledges of cash to help them reduce emissions and adapt to the effects of climate change, developing countries would walk away from an agreement.

They were not disappointed. The prior commitment of US\$100b a year by 2020 has been extended to 2025, by which point a higher goal will have been set for future commitments. Governments, private companies and development finance institutions (DFIs) made a flurry of nearer-term pledges. According to Overseas Development Institute figures, these include at least US\$66b from the private sector, more than US\$30b a year from DFIs by 2020, and US\$19b a year from governments. More broadly, the Paris Agreement aims to reduce climate change impact by "making finance flows consistent with a pathway towards low greenhouse gas emissions."

Alexis Gazzo, one of EY's Cleantech and Sustainability leaders based in Paris, considers the agreement is likely to add momentum to existing interest among power sector investors for assets in emerging economies, which offer attractive growth rates in contrast to low power prices and limited growth forecasts in many OECD markets.

"Among these investors, there is already a strong drive towards renewable energy investment in developing markets ... including in some more innovative market segments, such as off-grid," he says.

But governments and companies looking to develop low-carbon energy projects

in such countries can be forgiven for questioning how much has changed. Most promises made at Paris are for longer-term commitments. Despite collecting US\$10b in promised funding, the UN's Green Climate Fund is still in start-up mode. And private sector investors remain hesitant about committing to climate projects in many developing countries, often due to misconceptions about underlying economic or political risks.

"Paris has sent a very strong signal to investors," says Joe Thwaites of the World Resources Institute in Washington, DC. "The challenge is to take what governments have agreed and translate that into concrete plans for investment."

Planning pays off

For recipient governments seeking climate finance, the first priority is getting the basics right. "Capital tends to flow towards organized markets," says Michael Cupit, a London-based senior leader in EY's Energy Corporate Finance team. He notes that investors and developers want to see robust and transparent regulatory frameworks in place, covering property rights, land control, grid access and offtake agreements; they want confidence that any bidding process will be run fairly under clearly defined rules.

According to Gazzo, those emerging economies that have been successful in attracting renewable energy funding have invested in mapping the available resources and have made the information public. "This is part of the reason we've seen very competitive prices in some recent wind and solar tenders," he says, citing projects in Morocco and Jordan.

Both recipient governments and project

sponsors need to be able to demonstrate a clear investment case, Gazzo adds. "A lot of climate finance is via debt programs. They may be concessional, but they still have some requirement for a return on investment."

Development finance specialists hope the Paris talks have helped bring clarity to the two sides of the climate finance equation. Countries were charged with bringing to Paris emission reduction plans – labeled Intended Nationally Defined Contributions – which set out each country's climate financing needs. And, on the other side, the public and private pledges at COP21 made plain what sources of financing are available.

The goal now, says Ingrid Holmes of the UK-based think-tank E3G, is to marry international climate finance with domestic resources in target countries. "In the past, the focus was on getting money from overseas governments to finance things at home. Now, it's about owning the investment agenda, and looking at how best to deploy public funds from a variety of sources to leverage private finance, including from domestic savings."

A surprisingly high proportion of climate financing is already domestically sourced, says Barbara Buchner, senior director of the Climate Policy Initiative (CPI) in Venice, which tracks climate finance flows. Almost three-quarters (74%) of public and 92% of private climate finance flows in 2014 were intra-country.

There is more that host governments can do to encourage this domestic capital to flow into local low-carbon power projects. Cupit cites Malawi, where the equivalent of US\$325m of the US\$720m of locally held pension fund assets are on overnight



Workers clean PV panels at solar farm in Gujarat

deposit, as the local equity market is too small to absorb it. However, pension funds in the country are forbidden from investing in illiquid assets such as infrastructure.

Reducing risk

Cupit suggests that, in tandem with local rule changes, DFIs could offer guarantees or similar products to make such investments possible for domestic pension funds.

Multilateral development banks are already offering a number of risk-sharing products for climate-related projects in developing countries. James Close, director, climate change, at the World Bank in Washington, DC, cites the Scaling Solar Initiative. That program offers advice on solar siting, a standardized tendering process, document templates with attached concessional financing and a number of risk guarantees, such as credit enhancement for local power offtakers. "It creates a system where the concessional financing is used to cover some of the technology risk, and where payment risk from the [local] power offtaker has been reduced," says Close.

There is also a role for donors in helping to manage often-crippling currency volatility, according to CPI, which has proposed in India a government-sponsored foreign exchange hedging facility. A 10-year currency hedge, provided by the Government through the facility, would cost 16% of the current capital cost of a solar plant. Such a hedge would reduce the developer's debt costs by 7 percentage points, the cost of renewable energy by 19%, and the cost of government support by 54%, says Buchner.

Such risk-sharing tools can dramatically increase the attractiveness of power

generation projects in countries that might, on first glance, appear too risky for institutional investment, says Cupit. "We've compared the relative risk and return of projects along Europe's southern periphery and a number of African markets. By the time you've tapped into the various de-risking products available, you can find projects in Africa that present acceptable risk and offer better returns."

Medium term, there will be a growing need for investors – domestic and international – to be able to recycle limited development capital, notes Cupit. There is a role for DFIs and climate funds in helping to create secondary markets in power and utility assets, he says. Increasingly, Gazzo notes, the investment case for renewables in emerging markets is becoming compelling: "A lot of renewable energy technologies have made their case in terms of competitiveness, especially for off-grid applications.

"We still need to do some thinking on innovative financing and business models, and the framework conditions in which they could work. But there are scenarios where we can expect to see massive deployment of low-carbon technologies in developing markets."

The question is, how and when will the promised climate finance reach developers on the ground? It may be that, in the near term, it is best used to design and fund the appropriate policy frameworks, such as renewable energy independent power producer programs, and underwriting and de-risking project cash flows. Once the route to market is clear, private sector finance will flow at scale. Only then will the lofty objectives of the Paris Agreement be realized. ■

"There are scenarios where we can expect to see massive deployment of low-carbon technologies in developing markets."



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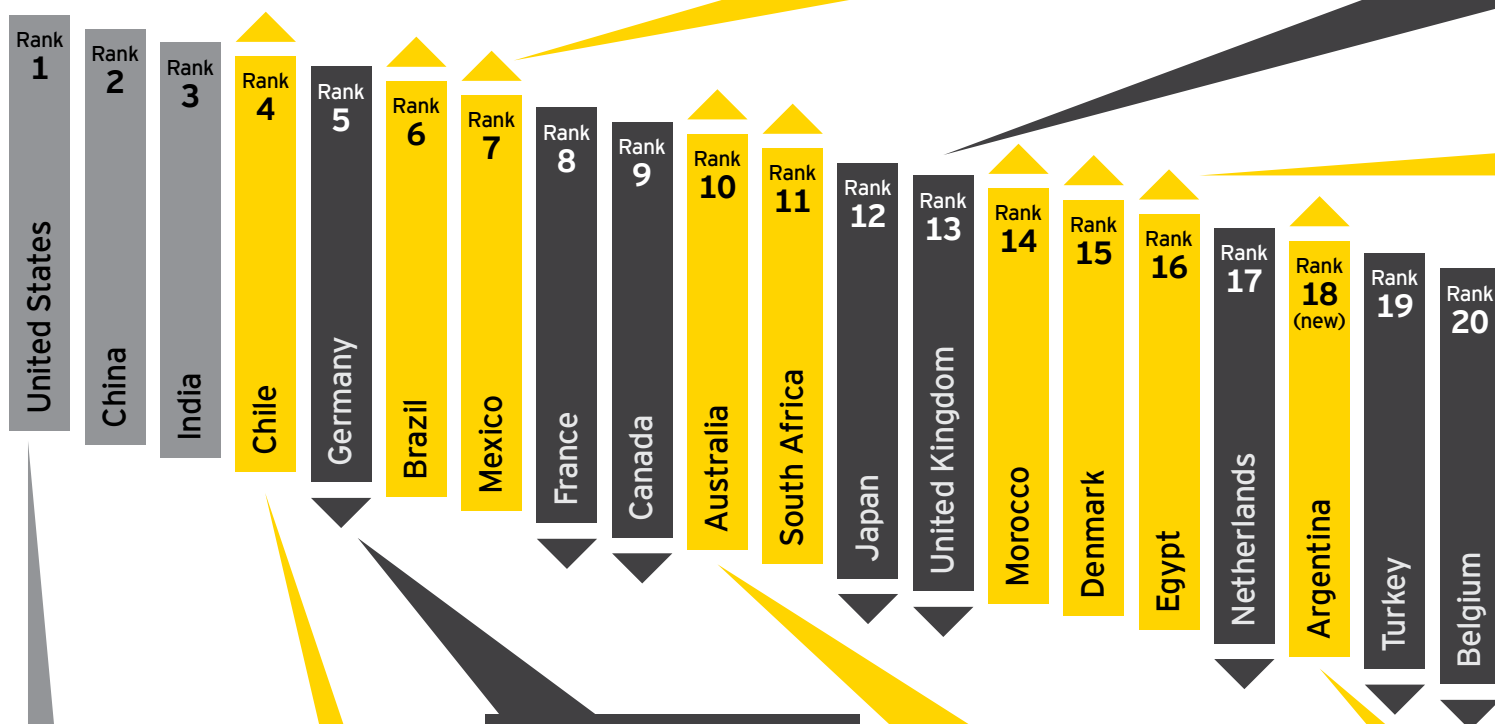
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May 2016

Mexico's first power auction saw more than 2GW of wind and solar PPAs awarded at highly competitive prices, building on already-strong macroeconomic conditions, a far-reaching energy reform program and a diversity imperative (see our article on page 19).



Proposals to limit renewables to 40% to 45% of the total generation mix have introduced significant uncertainty about long-term demand in Germany, particularly for onshore wind, which will be the balancing technology (see our article on page 18).

Australia's renewables market is bouncing back after near-paralysis caused by several years of hostile policies. State-level tenders and corporate off-take potential will likely drive activity in the near term, given the ongoing challenge of securing long-term PPAs (see our article on page 17).

Retaining the index top spot, the US is forecast to see an additional 41GW and 56GW of wind and solar respectively through to 2021, with 18GW of each attributed directly to the recent five-year production and investment tax credit extension.

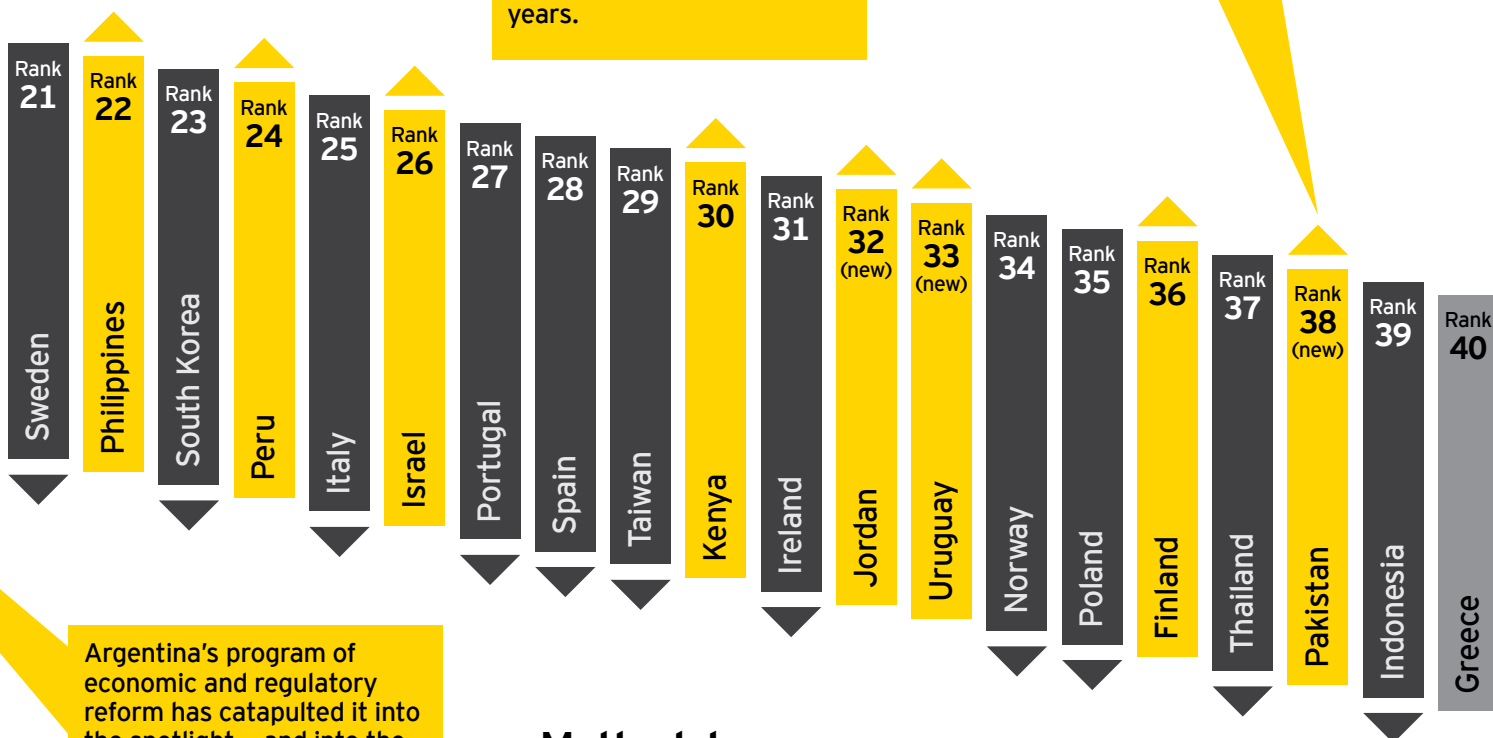
Despite being a relatively small energy market in absolute terms, Chile is continuing to attract a plethora of multi-GW projects, and is one of the first markets in the world to enable economically viable renewables projects to compete directly with all other energy sources.



The UK Government's noncommittal, if not antagonistic, approach to energy policy continues to go against the grain of almost universal global support for renewables. Not only stalling project development and investment inflows, this is arguably jeopardizing UK energy security.

Interest in Egypt's resource-abundant renewables market continues to grow, with a mix of tendered projects and multi-GW bilateral agreements contributing to the estimated 13GW of additional capacity required to meet soaring domestic demand over the next five years.

A robust policy framework and reported US\$3b of foreign renewables investment in 2015 sees Pakistan enter the index for the first time, already boasting mega projects such as the 1GW Quaid-e-Azam PV Solar Park and 1GW of proposed wind capacity in Punjab.



Argentina's program of economic and regulatory reform has catapulted it into the spotlight – and into the index – as a raft of targets, fiscal incentives and tender announcements provide the market with strong visibility over the country's long-term energy strategy (see our article on page 14).

Methodology

The index has been refreshed, 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

Key developments

SunEdison filing prompts a global flurry of deals

SunEdison's bankruptcy filing in late April has already triggered a whirlwind of M&A activity, with more undoubtedly to follow.

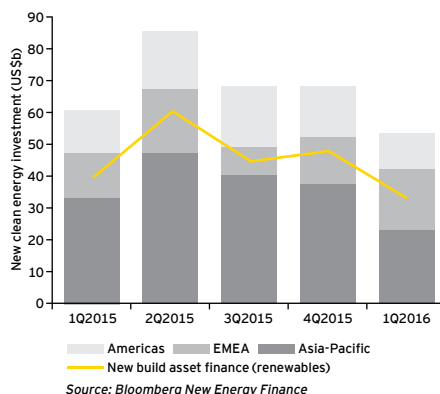
Ecotricity purchased the group's UK residential PV business, while Chilean power group Colbún has acquired 202MW of SunEdison's in-country PV assets, around 31% of SunEdison's total solar capacity in the country. It will likely still need to shed the remaining 450MW, as well as its 50% stake in 150MW of Brazilian capacity held alongside Renova Energia.

SunEdison's two yieldcos are not part of the bankruptcy filing and have been keen to reassure the market of their liquidity. However, both are still embroiled in lawsuits, highlighting the need for a successful yieldco model to ensure sufficient managerial and operational distance from developers.

India looks likely to be most impacted by the bankruptcy, given the SunEdison group's operations there were excluded from the US bankruptcy filing. SunEdison intends to continue its investment and expansion in the country, but is now seeking equity partners for the first time. While India does not normally allow the sale of development-stage assets, India's Energy Minister, Piyush Goyal, has indicated that an exception may be made.

SunEdison has around 700MW of solar capacity commissioned in India, and a

New clean energy investment worldwide in Q1 2016



further 1.7GW under development. However, with the country's total solar capacity currently around 6.7GW, this represents a sizeable portion, and there are concerns that so much capacity being released in the market could push down prices and make lenders reluctant to finance.

Investor nervousness in India is already heightened by the dramatic drop in solar tariffs, for which SunEdison has also been partly blamed given its low bid of US\$60/MWh for 500MW of solar capacity in Madhya Pradesh back in December. Nevertheless, the company appears determined to pursue its India ambitions – but reaching the target it set itself in 2015 of developing 15GW by 2022 now looks unlikely.

China seeks efficiency

Despite its economic downturn – although seeing some stabilization in Q1 2016 – China's renewable ambitions remain firmly intact, albeit shifting the focus to more efficient deployment.

While recently instituting province-level renewables quotas, the Government has prohibited local authorities from approving new wind projects in regions of high curtailment, and also intends to make conventional generators or transmission system operators pay renewables producers when their supplies are squeezed.

Notwithstanding, China is expected to increase its 2020 wind target to 250GW, a realistic figure according to GWEC. Sights are also set on up to 200GW of solar.

Meanwhile, tariffs for onshore wind and solar PV have been cut by as much as 4% and 11% respectively this year to account for falling technology costs, though still spurring the build-out of more than 7GW of solar in 1Q2016 alone.

Subsidies for offshore wind will be increased in 2017 to encourage a sector that is slowly regaining momentum after a failed 2010 tender program.

UK concerns grow

Yet further delays to a final investment decision on the proposed US\$26b Hinkley Point C nuclear plant leave the UK in serious jeopardy of a major energy supply deficit within the next decade. Further, indications that the Government's "Plan B" would be the capacity markets, rather than increased renewables generation, reinforce the already hostile policy environment for renewables.

The pending 23 June referendum on a possible EU exit is also creating concerns over the risk profile of UK investments.

More positively, this year could still see up to 2.5GW of solar deployed through projects eligible for the grace period following the 1 April renewable obligations expiry. The fact that the first of three offshore wind auctions, supporting up to 4GW of capacity, may be held later this year is also cause for optimism, though cost reduction conditions – and the Government's track record on policy U-turns – leaves some uncertainty.

Brazil ploughs on

While the market is understandably exercising some caution, Brazil's renewable ambitions have shown surprising resilience in the face of economic volatility, tighter credit markets and presidential impeachment proceedings.

Reserve tenders to award additional wind, solar and hydro contracts have been confirmed for July and October, following a late April A5 auction that saw more than 21GW of wind projects registered and set a US\$62/MWh price cap to offset higher financing costs, inflation and foreign exchange rate fluctuations.

Meanwhile, the likely sale of an increasing



A SunEdison project in Gujarat

Turbines in Chile's Atacama desert



Chile auction looks hot

Chile's upcoming auction to award contracts representing 29% of its regulated energy supply for the next decade is likely to attract yet more mega-scale wind and solar projects, with Bloomberg New Energy Finance forecasting at least 4.7GW of renewables capacity will be added in the next three years.

Notwithstanding some speculation that reduced mining activity due to the global commodity price slump could reduce demand for large-scale, off-grid projects in the north, the Government appears committed to achieving 70% renewable energy by 2050 (a seven-fold increase) and a 25% reduction in consumer power prices by 2021.

This will likely require further north-south transmission infrastructure investment or a focus on more scalable projects closer to populous demand centers in central and southern regions. Co-locating solar with grid-connected hydro projects is also attracting interest, such as Valhalla Energia's proposed US\$1.3b 600MW solar plus 300MW hydro project.

number of generation assets by energy companies seeking to recycle cash and shed debt, including state-utility Eletrobras, should create interesting transaction opportunities, with the declining Brazilian Real particularly attractive to foreign investors.

The country's hugely underdeveloped solar market also remains a potentially lucrative lure once the current economic volatility subsides.

Norway policy shift

As part of an overhaul of its 2030 energy policy, Norway intends to phase out the green certificate scheme to encourage projects to be commercially viable without subsidy by 2021, with no new certificates to be introduced in the interim.

The proposals also include ending the monopoly of transmission system operator

Statnett on interconnector ownership to enable the market to drive efficiencies.

Meanwhile, in February the state-owned utility Statkraft revived plans for a 1GW onshore wind project which was dropped last year amid concerns over falling power prices. The US\$1.2b facility would be Europe's largest onshore wind project and more than double Norway's installed wind power capacity.

Low prices in Morocco

2016 has already been a productive year for Morocco, with March seeing the award of 850MW of wind capacity across five projects – representing US\$1.1b of investment – to a consortium comprising Enel Green Power, Siemens and Nareva Holding. The tender returned record low bid prices, averaging just US\$30/MWh.

The country has also committed to two major hybrid PV-CSP solar complexes totaling 800MW. Expressions of interest for the first 400MW Noor Midelt complex were submitted in early 2016, while Noor Tata submissions are expected to be called later this year. February marked the inauguration of the first 160MW CSP phase of the Ouarzazate Noor complex, while the next two phases representing 350MW are scheduled to come online by 2018, making it the largest CSP complex in the world.

Egypt piques interest

While Egypt's current foreign currency crunch is causing some developers to put projects on hold, with central bank restrictions preventing local banks lending in dollars for projects receiving revenues in Egyptian pounds, the country's long-term potential is continuing to pique the interest of major international players.

An international consortium led by Terra Sola Group confirmed in April that it has started construction on a 2GW solar project backed by US\$3.5b of German funds. Days later, EDF Énergies Nouvelles announced it had signed three new wind and solar contracts. Both follow Siemens' US\$2.6b wind development, which broke ground in January, and reinforce the Government's appetite to sign bilateral deals for large-scale projects in addition to its centrally run tenders. ■

Nordex opts for first green hybrid loan/bond

The German wind turbine-maker Nordex SE has called upon a US\$627m bonded loan – or "*Schuldschein*" – to finance its acquisition of Acciona Windpower. The securities were purchased by a syndicate of banks, attracted by the ability to value the certified loan at par for accounting purposes, thereby making them distinct from bonds.

Not being listed, rated nor marked-to-market also typically makes the *Schuldschein* cheaper and less exposed to bond market volatility, enabling Nordex to double the size of its planned issuance. It was also the first such bonded loan to receive certification from the Climate Bonds Standards Board, and could galvanize a new kind of green asset class amid a surge in M&A activity across the sector.



Into the light

Argentina's new Government has made energy market competition a core pillar of its economic transformation, but laying the foundations of a robust regulatory framework will still be key to success.

Sebastian Kind and **Mauro Soares**, architects of the country's ambitious new renewables program, revealed to EY's Klair White why they think they're off to a good start.

Less than five months since taking office, Argentina's new pro-market government, led by President Mauricio Macri, has already liberated the foreign exchange market, cut export taxes and renegotiated foreign debt, after a major US\$100b default in the early 2000s effectively locked the country out of the international market.

Tackling crippling high inflation and interest rates are next on the list, but energy sector reform is also firmly in the spotlight. Argentina boasts one of Latin America's most competitive electricity markets; yet heavily subsidized retail power prices have distorted the market and cost the Government an estimated US\$51b over the last 13 years. Further, despite one of the largest shale gas reserves in the world, the country remains a net energy importer, a fact that becomes all the more worrying given 5% annual electricity demand growth projections.

The Macri administration has already started to remove energy subsidies by enabling significant increases in both power prices and natural gas prices. This is a staggering first step as the country embarks on its plan to fade out subsidies and strengthen the economics of its energy sector. However, it is the entrenching of ambitious renewables targets into legislation that is really expected to galvanize a major energy shift. Reforms to the 2006 renewable energy law, approved in September 2015 with overwhelming cross-party support, mandate the country to source 8% of its electricity from renewables by 2017, increasing to 20% by 2025.

Given renewables currently account for just 1.8% of power demand, meeting these targets will certainly be a challenge. Despite boasting world-class wind resource that could supply the entire continent's electricity demand, with an estimated



Pucara de Tilcara national monument, Argentina

2,000GW of potential and capacity factors exceeding 45% in some regions, the country still only has 223MW of installed wind capacity. Similarly, only 8MW of solar capacity has been deployed despite impressive irradiation levels.

PPAs and tenders

With the full support of the Minister of Energy and Mining, Juan José Aranguren, responsibility for designing and executing a program to achieve these ambitious goals has fallen to Sebastian Kind, the Ministry's Undersecretary for Renewable Energy, and Mauro Soares, National Director for Renewable Energy.

Achieving the initial 8% target alone will require 2GW to 3GW of new renewables capacity, which Kind confirms will be mostly procured centrally through long-term PPAs in a competitive tender process. The obligation to meet the country's new targets will fall upon all consumers, with the new regulations clearly establishing a mandatory pass-through of PPA costs via electricity bills.

He adds, however, that the new legislation also empowers large unbundled power users (with average demand greater than 300kW) to opt out of contributions to the tendered PPAs by sourcing renewable energy directly from IPPs, utilities, traders or self-generation projects, with prices set freely between the parties. Consumers that opt out but then subsequently fail to meet the mandated annual renewable energy quota will be subject to penalties that will be set based on the cost of diesel-based power produced.

The regulations supporting the revised renewables law are currently being drafted, including details of the proposed tender process, and are expected in the second quarter of this year, with the first auction potentially launched as early as mid-May. According to Soares, the initial tender will allocate between 800MW and 1,000MW of

capacity, rather than the full requirement, so that the Government can assess the outcome of the first round and refine the process as required. However, a tender schedule may emerge in due course, given as much as 10GW of capacity could be procured over the next decade.

Soares also notes that the first tender will prioritize projects in a more advanced development stage to help accelerate capacity deployment, with technology quotas initially based on the Government's assessment of the project pipeline. Despite the low level of capacity deployment over the last decade there has still been sizable investment in project development, resulting in a 2GW to 3GW pipeline of fully and almost fully permitted projects, mainly wind. This figure increases to around 6GW to 7GW when accounting for more recent activity that has established a pipeline of earlier-stage developments, double that required for the 2017 target. As such, achieving sufficient competitive tension early on is unlikely to be an issue.

Getting the auctions right

In a similar model to South Africa, the Government will implement a two-stage sealed bid auction process that evaluates projects on both price and non-price criteria, as well as on the strength of the bidding entities. Further, in recognizing the potential impact of natural resource on pricing, separate auctions may be held for projects in high-resource areas, such as the windy Patagonia region.

The Government is also undoubtedly expecting to see highly competitive pricing, given the record low prices emerging from recent auctions in Mexico and Peru. On the now often-cited challenge of whether such low prices are sustainable, Kind notes that the benefit of markets developing later is that prices can reflect lower technology risks, cheaper cost of capital and more reliable resource forecasting.

Sebastian Kind

Undersecretary for Renewable Energy, Ministry of Energy and Mining



Before joining the Macri administration, Kind was part of the team that drafted Argentina's renewable energy

legislation, and is an advisor to the nation's Senate. A mechanical engineer, he spent 15 years in the renewable energy sector, holding executive positions in various commercial organizations, and set up and directed the renewable energy Masters program at UTN, Argentina's National Technological University.

Mauro Soares

National Director for Renewable Energy, Ministry of Energy and Mining



Soares leads the Ministry's multidisciplinary team that is overhauling the legal framework for Argentina's renewable energy sector.

He is a Board member of CADER, the country's Chamber of Renewable Energy. Prior experience includes senior roles in unconventional resources at Tecpetrol S.A. An economist, he is also Professor of Energy Markets at UTN.

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Construction at the El Torcido Wind Farm in Chubut Province, Argentina

However, he also comments that, notwithstanding the overwhelming time pressure to meet these targets, ensuring project deliverability via a well-designed, transparent and robust tender process remains the top priority, in order to minimize the risk of attrition between project award and financial close. Although there needs to be trust in the market to set prices and deliver them, Kind affirms that the Government is still seeking to leverage tools and resources that enhance the deliverability of its renewables program and bring forward the right projects.

This focus on deliverability has therefore prompted the Government to also establish a sector-specific trust fund – Fondo para el Desarrollo de Energías Renovables, or FODER –comprising two discrete accounts. A guarantee account will support payment and termination guarantees for all PPAs in the event of off-taker default, and will be funded by specific charges on consumer electricity bills. Further, the Government is seeking a World Bank AAA-rated solvency guarantee over FODER, which Kind says should provide investors with an extra shot of confidence over this PPA protection.

FODER will also establish a project finance account to enable co-lending of up to 50% of a project's debt requirement, itself funded by a combination of treasury funds, public offerings, pension funds and

multilateral/climate fund contributions. In particular, the fund will receive at least 50% of the savings on fuel imports resulting from the switch to renewables, expected to exceed US\$25b by 2025. Critically, in acknowledging the time required to build up the fund, the treasury has already committed an initial US\$800m to support the first wave of projects.

However, Kind also notes that, while FODER funding will be made available to all tendered projects to ensure capital availability is not a hindrance to project delivery, those requiring limited or no co-financing will be preferred. The amount of FODER financing will therefore be assessed alongside other non-price evaluation criteria, such as local content integration and time to reach commercial operations.

Going local

On the often controversial issue of local content obligations, Kind emphasizes that the initial tender will not mandate a specific proportion; instead, projects using more local resources will score better and secure priority access to FODER project financing. This should allow the market to both determine and drive the maturity of the domestic supply chain, and avoid the risk of bottlenecks from setting prescribed requirements too high or missing local economic development opportunities if too low.

Soares confirms, however, that the Government will still introduce various incentives to accelerate development of the domestic supply chain, including a FODER sector-specific development credit line for local suppliers and manufacturers, import duty exemptions for equipment and components, and a 20% tax credit on locally supplied capex. These are part of a broader package of fiscal and tax incentives that will be available to all projects, regardless of whether they are allocated via tender, though Soares notes such benefits are strongest for projects starting construction before the end of 2017, and will decrease gradually over time through to 2025, as set out in the amendment to the renewable

energy law passed last September 2015 (Law 27191).

Despite reforms still being rolled out, the country's shifting energy focus is already spurring significant international interest, with major energy companies including Enel, Vestas, Gamesa, ENI, Iberdrola, NRG Systems and Mainstream Renewables all participating in recent political and trade delegations to scope out the prospects of a burgeoning renewables market. Global development finance institutions, commercial banks, sovereign and private funds are also revisiting opportunities in the country as the investment climate improves.

Even large energy consumers are already stepping up; the Argentinean unit of US chemical group Dow, for example, is investing US\$123m in a 65MW wind farm in Rio Negro province to both power its industrial operations and meet its 8% renewables obligation.

Healthy skepticism

The growing interest in Argentina's renewable energy market is therefore already evident, but also perhaps unsurprising. In addition to its enviable natural resources, Argentina is Latin America's third largest power market, boasts the most educated population in the region and is the second most industrialized country after Brazil, establishing strong energy demand and economic growth fundamentals.

And yet some skepticism is also to be expected. With the country trying to throw off the shackles of a decade in political and economic isolation, the success of the latest reforms will depend heavily on the Government winning back credibility across both domestic and international communities. Yet Kind notes that, far from reinventing the wheel, the Government is simply trying to make Argentina a "normal" market-driven economy open to trade, competition and investment.

The first five months have arguably already delivered in laying the initial foundations for Argentina to re-enter the global arena, but it has also created high expectations. What matters now is results. And so, when challenged on whether the country can possibly achieve the highly ambitious renewable energy targets it has set for itself, Kind's response is very simple – the rule of law now requires it, therefore we must achieve it.

Well, it's difficult to argue with that. ■

"The Government is trying to make Argentina a 'normal' market-driven economy open to trade, competition and investment."

Sector optimism battles policy void

While the many months of uncertainty from the Warburton review of Australia's Renewable Energy Target (RET) have now passed, the time taken to recalibrate the RET resulted in little progress in the sector during 2014-15.

As a result of this pause in new-build activity, the sector is now left with around 5GW to 6GW to build to meet the 33TWh RET by 2020 (although the mechanics of the scheme mean that the sector actually has an additional three years to reach that target). Given that there are also a number of additional, primarily state government-related renewables procurement schemes, demand is set for significant growth as the market races to supply it.

It is critical, however, that this optimism translates into bankable PPAs, and this is still a major challenge. Prolonged policy uncertainty, price slumps in Large-scale Generation Certificates (LGCs), vertical integration and the short tenor of the retailers' own commercial and industrial customers: these factors mean few long-term PPAs are being signed with third-party developers, and utilities have typically offered relatively short three- to five-year contracts.

However, the signing of a 15-year PPA in March 2016, by major retailer Origin Energy for the 56MW Moree Solar Farm, is being noted as something of a landmark deal, with hopes that it will spur more long-term contracts, although it leveraged partial merchant financing prior to PPA and benefited from support by the Australian

Renewable Energy Agency (ARENA) and the Clean Energy Finance Corporation (CEFC). Overall, with declining time before the RET ends in 2030, the case for long-term PPAs for 15 years or more appears increasingly difficult without long-term policy certainty.

That said, project sponsors appear to be adapting to the current challenges. Some projects are being brought forward with full or partial merchant financing ahead of securing PPAs, such as 240MW Ararat and Goldwind's 175MW White Rock wind as well as the original Moree investment. However, these are typically a bridge to PPA and few appear to want to operate assets on a merchant basis. While LGC spot prices have been at all-time highs, few expect this trend to remain once supply returns to the market.

Much-needed liquidity in PPAs has been coming from various state government-related procurement initiatives, such as the tender programs being run by the Australian Capital Territory and Queensland's Ergon Energy. Furthermore, the corporate PPA market, having gained so much ground in the US and Europe, appears to be just around the corner in Australia. A number of parties are preparing to participate, although no clear first-mover has appeared, except for one 200kW corporately-procured project by Sydney's University of Technology. Organizations such as the WWF's Renewable Energy Buyers Forum are helping this market gain traction.

Have cash, need clarity

There are signs that the investment gap caused by a PPA void is closing, with many funding sources being brought to market. AGL Energy has unveiled an unlisted investment fund of up to A\$3b (US\$2.3b) to develop 1GW of utility-scale renewables, albeit offering PPAs of only 5 to 10 years.

Meanwhile, CEFC has agreed to back A\$100m (US\$76m) of equity in Palisade Investment Partners' plans to build a A\$1b portfolio of renewables projects.

March did see the Australian Government propose an A\$1b (US\$772m) Clean Energy Innovation Fund – jointly overseen by CEFC and ARENA – to provide debt and equity to support more innovative and higher-risk projects at early stages of development, including large-scale solar plus storage, offshore energy, biofuels and smart grids.

Separately, ARENA's large-scale solar A\$100m (US\$76m) funding program is due for final applications in June, and is expected to deliver around 200MW of utility-scale solar to the market.

While sector optimism has returned in force, at least in terms of activity, an element of caution still remains. The sector will be watching the forthcoming election – now set for July – very closely for changes in leadership, the current RET policy, long-term (post-2030) policy guidance and funding support from CEFC and ARENA.

A number of background factors are influencing the market, including declining demand, future plant retirements and intermittency impacts on networks. But, ultimately, more far-reaching energy policy measures will be critical to take Australia's renewable sector beyond recovery and into long-term growth. ■

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"The case for long-term PPAs appears increasingly difficult without long-term policy certainty."

The Sydney Opera House with Harbor Bridge



Onshore wind faces risk premium

It is likely that 2016 will be another headline year for onshore wind in Germany – but for all the wrong reasons. Developers are scrambling to get projects in the ground under the existing EEG renewables law, as more details emerge of the increasingly controversial tenders and capacity caps that are set to take effect later this year.

Last year, renewables supplied a staggering 33% of Germany's electricity. However, revised legislation proposes a cap of 40% to 45% power from renewables by 2025 – a figure that was previously the minimum target – amid concern over the effect on consumers' bills of increasing renewables subsidies. This leaves just 12 percentage points of headroom for the next 10 years, squeezed further if 2016 does deliver strong

onshore wind deployment levels as forecast – a worrying prospect for a sector seeking visibility over long-term demand.

The draft legislation also sets specific technology caps and provides greater clarity on the timing of proposed tenders for wind and solar projects based on a “contracts for difference” structure. Such a tariff system has been in place for large-scale projects since 2012. However, the auction system introduces more binary risk over securing 20-year contracts and the guaranteed price is subject to competitive bidding. Small-scale projects will continue to be eligible under Germany's existing feed-in tariff regime, albeit subject to degression rates that also track installation caps.

Increasing uncertainty

The proposals indicate onshore wind tenders will commence in May 2017, with three to four auctions each year. Initially, 2.9GW of capacity will be available – including capacity to cover repowering – while later auctions will vary depending on deployment of other renewable technologies.

However, while earlier drafts had suggested variable tendered onshore wind capacity would not fall below 2GW per year, revisions in April omitted this minimum volume. In short, onshore wind capacity becomes a balancing figure to control the overall expansion of renewables.

This has introduced significant volume uncertainty in addition to the inherent risk of bidding for PPAs, and unsurprisingly has become a profound concern across Germany's onshore wind sector. It could also force developers to add a considerable risk premium to bring forward projects.

Further, the complexity of the bidding process, including the need to have pre-developed sites and link prices to wind resource reference locations, is likely to skew the market towards larger companies, and away from the co-operatives and rural landowners that currently account for a large part of Germany's onshore market.

Offshore wind and solar PV have fared better in terms of clarity over anticipated demand, although concerns remain that low capacity caps will stifle the market.

For solar PV, annual tenders allocating 500MW of capacity will be held from 2017, following a series of smaller pilot tenders in 2015 and 2016. The fourth such tender, in April this year, was more than four times oversubscribed and saw the winning bids

“Germany should be raising its renewable ambitions, not lowering them, if it wants to meet its ambitious emissions targets.”

offering an average €74.1/MWh (US\$84), a 7% reduction on January's third round. The next pilot auction will begin 1 August 2016.

Annual offshore wind tenders allocating around 800MW will be held from 2020 onwards, while projects operational before then will continue to receive current fixed tariff premiums. However, in mid-April, the Government confirmed it will also hold special auctions in March and December 2017, awarding 1.46GW in both.

Given 2015 saw 2.38GW come online, taking total offshore capacity to 3.29GW, the Government has acknowledged that current momentum in the sector, combined with the 2017 auctions, could see as much as 7.2GW by 2020, compared to its earlier target of 6.5GW. It has therefore proposed that post 2020 tender caps could be adjusted downward (below 800MW) to bring total capacity back in line with a new interim offshore wind target of 11GW by 2025 (and subsequently 15GW by 2030).

While the proposed revisions to the EEG may have different repercussions by technology, there has been a common reaction – now is the time for Germany to be raising its renewable ambitions, not lowering them, if it wants to achieve further cost reductions and meet its ambitious COP21 emissions reduction targets.

The draft legislation will now be considered by parliament, with a view to passage by the middle of the year. What is clear, however, is that the manner in which Germany executes this shift to a more market-based system, intended to comply with EU state-aid rules announced in 2014, will be closely watched across Europe. The real question is whether renewable energy investors will also stick around to find out how it goes. ■

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The Brandenburg Gate in Berlin

Landmark auction launches huge opportunity

It wasn't an auspicious start: Mexico's first electricity auction, held in March, had to be re-run after an erroneous bid skewed the outcome. But the landmark tender ultimately saw 16 wind and solar projects representing just over 5.4TWh (2.1GW) strike energy supply contracts at some of the lowest solar prices seen globally, opening up a multi-billion dollar investment opportunity.

Praised for its transparency, competitiveness and the availability of dollar-denominated contracts, the tender saw 10 bidders secure 15-year PPAs with the state-owned utility, Comisión Federal de Electricidad (CFE), an estimated US\$2.5b of investment.

Initially 15-times oversubscribed, the final auction results saw an average price of US\$45/MWh for 1,691MW of solar PV capacity and US\$55/MWh for 394MW of wind. Major winners included Enel Green Power (41.6% total energy awarded), Sun Power (18.7%), Acciona Energia (10.8 %), and Jinko Solar (9.3 %).

The tender's success comes months after Mexico opened up its power market to private sector competition, ending the state monopoly. It also bodes well for the achievability of a target to generate 35% of the country's energy from clean sources by 2024 and 50% by 2050, compared with around 15% today (75% hydro).

The Government originally forecast that around 12GW of wind and 3GW of PV would be required to meet the 35% target – a tall order given current capacities of 3GW wind and 290MW solar. However, post-auction market projections estimate 15GW wind by 2024 and 7GW-8GW solar by 2020. A second, refined tender process offering around 50% more energy than the first auction is expected to award new contracts by September 2016.

The auction also saw bidders secure 5.4m green certificates with a 20-year maturity.

These will in turn be sold to large electricity consumers to meet a government-mandated obligation to source 5% of their energy from sustainable sources by 2018, unless purchased or generated directly.

Caution advised

However, the auction process was not an unqualified success, awarding only 85% of CFE's tendered 6.36TWh of energy demand, while a simultaneous auction for 500MW balancing capacity attracted no bids.

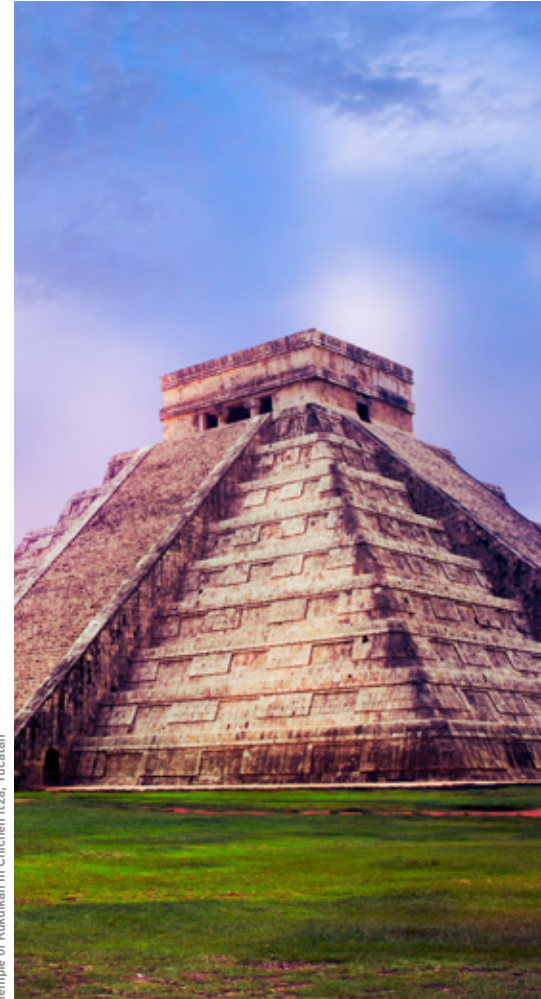
The record low prices have also reopened debate over whether all the projects will be built, given relatively high levels of project attrition in the region. Bidders were not required to secure sites or financing ahead of bidding, while complex pricing algorithms applying regional nodal, currency and indexation adjustments may also increase pricing risk – evidenced not least by the need to re-run the auction.

The fact that solar prices fell below very low wind prices was a shock, though perhaps with hindsight shouldn't be. Mexico's significant solar resource, the use of nodal pricing to prioritize power sold at certain grid points, and the fact that no wind projects appear to have been bid in the high-resource Oaxaca region were all likely contributing factors.

Mexico's stable political and economic climate, flexible labor market and low wages relative to the rest of the region, are also likely to have reduced the risk premium for projects, while the attraction of larger companies typically brings access to cheaper financing.

There has also been speculation that some developers might be seeking to anchor projects with loss-leading PPAs to get a market foothold and then sell additional power to private clients at higher prices.

The only way to settle the debate over project attrition will be to actually deliver the projects. While deploying 2.2GW of



Temple of Kukulkan in Chichen Itza, Yucatan

"Market projections estimate 15GW wind by 2024 and 7GW to 8GW solar by 2020."

solar alone within the next two years is no small challenge given the market's current immaturity, the auction has created an air of optimism, particularly with some of the world's most experienced project developers in the driving seat. However, the Government will still need to review and enhance the tender process if it wants to avoid another embarrassing "take two." ■

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EYG no. 00845-164Gbl
ED None

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Design and production: CPL | www.cpl.co.uk

Content lead: Mark Nicholls

Cover image: Pylons and wind turbines flank the Mehrum coal-fired power plant near Hohenhameln

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