

RECAI

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Renewable energy country attractiveness index

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The battle for the top 10

An increasingly diverse policy landscape has prompted a major top-10 reshuffle, with renewables rollbacks in Germany and the UK resulting in a slip down the index while a clean energy push sees India, Brazil and Chile continue their ascent.

US retakes the crown

The potential of President Barack Obama's Clean Power Plan to galvanize renewable energy investment through to 2030 has prompted the US to take the index top spot from China, where economic woes and grid constraints overshadow ambitious targets.

Optimizing the role of policy

Strategic risk allocation through public-private partnerships may prove to be the most effective way to bring forward new utility-scale generation and optimize the economic benefits of emerging renewable technologies.



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working world



Renewable energy country attractiveness index

Chief Editor's note



Ben Warren, RECAI Chief Editor

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Climate change by default. I have long advocated that renewable energy must (and will) prevail on the grounds of economic attractiveness, living in a world without subsidy. It is this unstoppable march toward grid parity that will continue to galvanize the flow of unprecedented levels of dollar power into the buildout of multiple gigawatts of renewable energy. In its latest long-term projections, Bloomberg New Energy Finance (BNEF) sees US\$3.7t of investment in solar alone between now and 2040, largely due to panel prices plunging a further 47%. This will result in solar accounting for more installed capacity globally than any other technology – around 35% compared with just 2% today.

However, the increasingly compelling economics of renewable energy have taken something of a backseat in recent months, with newspaper column inches instead dominated by the more controversial climate change conundrum. It is difficult not to get swept up in the excitement as the world's media churn over the facts and figures of landmark initiatives such as the US Clean Power Plan, and the various pledges being made ahead of December's United Nations climate change conference in Paris, when almost 200 country leaders will come together to try to form a legally binding and universal agreement on how to mitigate climate change.

It's not only policymakers who are riding the climate change wave. Executives from 13 major US corporations have pledged to invest at least US\$140b to decrease their carbon footprint, while an encyclical by Pope Francis in June, urging the world's 1.2 billion Catholics to help cut fossil fuel emissions, also helps to depoliticize the debate.

However, in an energy market where "business as usual" no longer exists and the majority of the world's population is experiencing some form of energy crisis, waiting for a global pact that has set itself the somewhat gargantuan challenge of saving the planet should perhaps not be plan A.

Rather, we should be putting the cost-effectiveness, flexibility and scalability of renewable energy center stage, creating a virtuous cycle of increased deployment driving cost reductions, driving yet further deployment of secure, affordable and low carbon energy.

And if we do this, our climate change goals will surely take care of themselves – right?

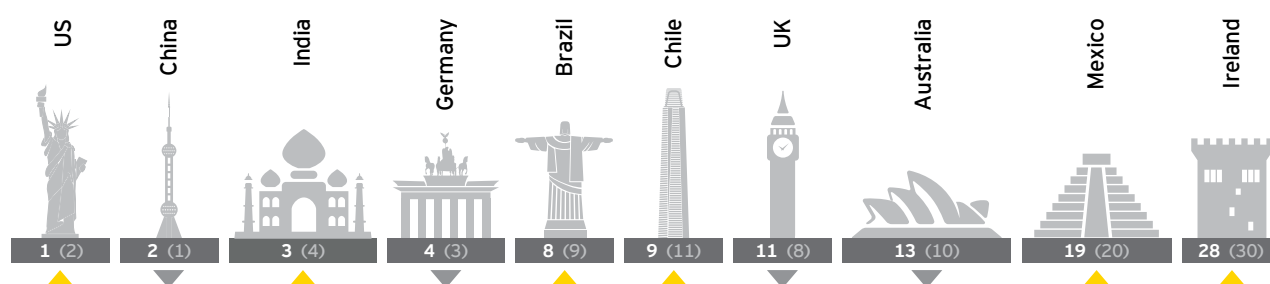
Ben Warren
Global Power & Utilities Corporate Finance Leader

At a glance ...

An increasingly diverse energy policy landscape prompts a major index reshuffle, as some markets elevate their renewables ambitions while others rein them in. But, utility-scale generation remains critical for most.

Key index movements

() = Previous ranking



As utility-scale generation re-enters the spotlight ...



Quarterly developments

Where's "hot" ...

Chile
Chooses cheap

France
Finish line

Mexico
Momentum

... and "not"?

Australia
Wind war

Spain
Storage woes

UK
Policies unravel



Summary

An overview of this issue

The power of power

In a world increasingly demanding 24-7 power and using greater electrification as a catalyst for economic growth and job creation, never before has affordable and sustainable energy been so important. But even more critically, never have we needed so much of it.

Therefore, while small-scale and distributed generation have attracted more focus in recent times, perhaps a renewed focus on the most efficient mechanisms to deliver utility-scale power projects is now needed.

With onshore wind and solar PV hurtling toward universal grid parity, the deployment of large-scale renewables is already an economic no-brainer in many markets. It's also a big tick for the climate change agenda, as well as easing economic woes exacerbated by expensive energy imports in some markets.



However, a number of emerging utility-scale technologies, such as concentrated solar power (CSP), offshore wind, marine and geothermal, offer significant potential yet remain underexploited to date.

Getting strategic

The increasingly important role of public-private partnerships (PPPs) in galvanizing large-scale energy projects, and less mature technologies in particular, is therefore explored in this issue.

PPPs can be useful mechanism to address the fact that the financial optimum is not necessarily the economic optimum when it comes to utility-scale energy generation, enabling a greater focus on industrial integration, job creation and energy mix diversification. Effective risk allocation that enables each party to focus on core competencies and helps to drive down transaction and project costs also emerges as a key PPP component, albeit executed with varying degrees of success.

With competitive tendering in particular having emerged as the most common PPP structure in determining energy market dynamics, we focus particularly on what's required to achieve effective risk allocation and navigate the trade-offs to maximize the benefits of auctions and minimize the challenges.



Learning lessons

In an exclusive interview, Dayae Oudghiri, Head of Strategy and Development at the Moroccan Agency for Solar Energy (Masen) reveals how Morocco is delivering world-class generation projects in a timely and cost-effective way based on innovative financing structures and strategic risk allocation.

Offering a view from the market, Joseph Desmond of BrightSource Energy Inc., operator of the world's largest CSP plant, tells us why appropriate government support can make or break a project, and why the technology is far from niche.

Shaking things up

President Barack Obama's Clean Power Plan (CPP) has not only shaken up the US energy market, but also our index. This issue sees the US return to the top spot ahead of China as it rolls out what is arguably its most comprehensive and far-reaching national energy legislation to date.

While our article on page 24 highlights that it's unlikely to be plain sailing for the CPP, the plan's unambiguous state-level emission reduction targets create a strong remit, and opportunity, to significantly increase the deployment of renewable energy capacity across the country over the next 15 years.

While China continues to dwarf the US in terms of new renewables investment and deployment, the current economic slowdown, limited evidence of foreign participation in the market despite government efforts to open it up and grid constraints contribute to its slip to second place.

Blind ambition

Elsewhere in Asia, India continues to dominate the headlines with multi-gigawatt project and multi-billion-dollar investments. While various challenges are making many skeptical that India will achieve 100GW of solar and 60GW of wind by 2022 (see our article on page 32), there is little doubt that its ambitious targets have galvanized the market and prompted economic and political reforms that are creating the foundations of an extremely attractive long-term market.

This has prompted a shift up to third place ahead of Germany, where capacity deployment has slowed and a new auction regime has raised fears about smaller developers being squeezed out.

Top 10 battle

Another European market slipping down the index this issue is the UK. Plummeting three places and falling out of the top 10 for the first time in

its RECAI history, a raft of policy measures in recent months threaten to paralyze the historically attractive UK renewables market (see our article on page 35).

However, the UK's fall in the index does make way for Latin America's hottest markets to cement their position in the top 10. Despite challenging economic conditions in Brazil, government proactivity in addressing key challenges such as low tariffs, and an increasing focus on its untapped solar market takes it up to eighth place. Meanwhile, the success of renewables in Chile's technology-neutral energy auctions and a continuing flow of large-scale project approvals justify its climb to ninth place.

Best of the rest

Other notable index movements include Mexico's rise to 19th place in the wake of a transition to a wholesale electricity market and tradable renewable energy certificate regime that is adding momentum to a market already attracting significant international investment. Details of the country's first energy auctions are also expected to be announced in October.

Turkey's long-term investment and deployment potential see it jump to 15th place, though our article on page 38 also reveals why the market is proving to be something of an enigma in the short term.

Meanwhile, Ireland climbs two places to 28th position. Historically penalized for its lack of solar market and waning demand for wind projects, a sizeable private sector commitment to develop solar projects in the country, and the



decision by UK regulator Ofgem to revisit a potential 500MW subsea interconnection to facilitate Irish power exports, has increased Ireland's attractiveness alongside an improving economic outlook.

Kicked when down

Yet more bad news for already battered renewables markets in Australia and Spain prompt further falls to 13th and 25th place respectively. Australia's Government appears to have launched an all-out attack on the country's wind sector while apparently softening toward utility-scale solar. Meanwhile, Spain also appears to be targeting its austerity measures, with plans to tax residential solar systems that specifically apply battery storage, while also preventing such systems receiving payment for selling excess power back into the grid.



Going large: optimizing the role of policy

With a growing number of markets seeing large-scale renewables projects lock-in record low prices and grid parity no longer the stuff of dreams, is it time for policymakers to pack up and go home? Not yet, says RECAI Editor Klair White, but it is time to get more strategic.

The rapidly growing market for small-scale or distributed generation and the role of the empowered energy consumer have dominated many headlines and analyst reports over the last 12 to 18 months. And rightly so. However, in a world that is increasingly demanding energy 24-7, retiring a significant number of aging large-scale (and usually carbon-intensive) power plants and using widespread electrification as a means of boosting economic growth in emerging markets, the role of utility-scale generation in keeping the lights on should not be understated.

The question is, which technologies are best placed to deliver this and to what extent do policymakers have a role making it happen?

Supply and demand

In an ideal world, the answer would be the most cost-competitive technologies, determined by market supply and demand alone. Achieving grid parity with conventional energy sources has long been considered the end goal for renewables, reaching the point where the market is effectively indifferent between the two on a cost basis. In that world we could finally cut out the policy middleman and simply choose the projects offering the highest returns for the lowest risk. Yet, as we now find ourselves standing at that tipping point in an increasing number of markets, with onshore wind and solar PV in particular delivering highly competitive prices, it seems policy is still playing a significant role in shaping the global energy landscape. Why?

Leveling the playing field

On one hand, the dark truth is that many conventional energy sources continue to receive some form of support, whether financial, regulatory or political, often so deeply entrenched that it can be difficult to even identify. However, recent analysis by the International Monetary Fund (IMF) estimates that fossil fuels are still subsidized at around US\$10m per minute. To leave renewable energy alone entirely to the whims of market forces therefore seems discriminatory.

However, even where all energy sources are able to compete on a level playing field, a market left to its own devices may deliver the most cost-effective energy supplies, but at the expense of other key objectives. Energy security (through both domestic generation and diversification), local industry creation, environmental goals and

critically, energy system reliability have rapidly risen up both political and boardroom agendas. Therefore, while individual projects may be attractive, the cumulative impact must also be considered, prompting a need for policy measures that somehow keep a gentle hand on the tiller to guide markets toward an “optimal” energy mix that can achieve varying objectives.

Limiting factors

Undoubtedly, both policy support and market forces have already enabled onshore wind and solar PV to rise to the challenge of providing energy at scale that can compete with even the largest conventional power plants. Yet the rapid build out of these now relatively mature renewable technologies has also caused supply imbalances, infrastructure challenges, transmission bottlenecks and curtailment across a number of markets. Some are also facing land or natural resource constraints that limit the future potential of such large-scale projects, whether due to topography, population distribution or saturation of the best sites.

Fresh thinking

This is prompting an increasing focus on a new breed of technologies with the potential to deliver game-changing utility-scale energy generation assets while overcoming some of these challenges, as well as providing new opportunities for industry creation, jobs and energy mix diversification.

Mega-scale CSP projects already operational or under construction in markets such as Morocco, South Africa, the US, Israel, Chile and the UAE, for example, are proving their ability to effectively meet the demand profiles of specific markets or energy consumers, particularly where combined with thermal energy storage to effectively provide dispatchable baseload energy. Hybrid CSP-PV solutions are being explored, while CSP also boasts heat applications that solar PV cannot compete with. The relatively basic nature of the components required to deploy CSP technologies also enable a high degree of localization.

Other less mature renewable technologies such as offshore wind, marine and geothermal also have a role to play in generating utility-scale heat and power. All typically boast higher load-factors, lower intermittency and greater predictability than onshore wind and solar PV, and are more suited to large-scale installations given

sites are typically away from high population areas. Even in the US – often a victim of partisan politics – a cross-party bill has been proposed calling for a 30% investment tax credit for the first 3GW of operational offshore wind capacity. Meanwhile, financial close of the first 500MW phase of the 1GW Corbetti geothermal project in Ethiopia – also the country's first independent power project (IPP) – reinforces the potential for large-scale first-of-a-kind transactions in emerging as well as developed markets. These technologies could also benefit from the experience, skills and equipment of an oil and gas sector increasingly looking to diversify in the face of commodity price volatility and a changing energy landscape.

Avoiding the pain

However, with such technologies generally less cost-competitive given their relative immaturity at commercial-scale, the role of governments as core commissioners or facilitators remains important. Yet, policymakers are understandably cautious in determining the most effective delivery models to bring forward such projects at scale in the most cost-effective way. Many markets have already felt the pain of up to two decades of effective but often distortive policy measures to spur renewable technologies, typically based on relatively blunt price and volume instruments such as feed-in tariffs (FITs), feed-in premiums (FIPs), renewable purchase obligations (RPOs) and tradable certificate schemes. Few are now likely to have the appetite to simply use expensive revenue-based subsidy schemes to encourage new technologies.

Rather, an increasing number of governments are turning to less distorting forms of intervention that establish public-private partnership (PPPs) to facilitate a more effective risk allocation between different parties that enables each to focus on its core competencies, as well as driving broader market efficiencies.

Leading the way

Two markets that have successfully deployed PPP strategies to develop utility-scale projects are Morocco and South Africa. Both

have utilized a competitive bidding process to spur both mainstream and emerging renewable technologies, rapidly becoming the preferred model for procuring generating capacity.

However, Stephen Auton-Smith, who played a major role as part of EY's financial advisory team on both the South African Renewable Energy Independent Power Producer Procurement (REIPPP) and Morocco's NOOR Ouarzazate II and III CSP tenders, notes that the two have applied very different PPP procurement models that reflect varying degrees of risk sharing between the project developer and energy offtaker, as summarized below.

In South Africa, the Department of Energy is responsible for procuring power across all technologies, while the Kingdom of Morocco has separated responsibility for different renewable sources. State-owned national utility Office National de l'Electricité et l'Eau Potable (ONEE) is responsible for procuring hydro and wind energy, while a dedicated entity – the Moroccan Agency for Solar Energy (Masen) – has been created to spur solar energy generation, although both Masen and ONEE are deploying a similar PPP model.

Public vs. private

Both markets guarantee bidders a 20- to 25-year power purchase agreement (PPA) based on a fixed tariff rate. However, according to Auton-Smith, Morocco has adopted a more public sector-led PPP model that sees the government offtaker take responsibility for site selection and land allocation, and subsequently retain the asset at the end of the contract period. This model is utilized for most infrastructure projects across the Middle East and North Africa (MENA) region (and elsewhere), although Morocco's PPP approach also sees the Government take on additional project development and delivery risks with the goal of driving down prices, accelerating capacity deployment and achieving an economically optimal outcome. This compares to a more private sector-led approach as in South Africa, where the majority of risks are retained by the bidder and priced in accordingly.

Key characteristics of PPP-based renewable energy procurement models in Morocco and South Africa

	Morocco	South Africa
PPP procurement model	Sealed bid competitive tender to allocate individual projects based on a specific technology and capacity size to a single bidder. Tenders either award a single project (e.g., Ouarzazate CSP phase I) or multiple projects (e.g., the tender of five predefined wind projects totaling 850MW is currently underway).	Sealed bid reverse auction to allocate a fixed total capacity to multiple bidders across multiple projects of varying scales. Typically multiple technologies per round, although each represents a separate auction with capacity caps set per technology (carrying over to next round if not reached).
Site selection	Specific sites are evaluated and selected by Masen/ONEE, and allocated to successful bidders.	Site selection and access are the responsibility of the bidder.
Grid	Grid access and tariffs are guaranteed by Masen/ONEE	Grid connection (access and cost) is negotiated by bidders with Eskom and is a developer risk.
Asset ownership	Developer for the 25-year contract period, then reverts to the Kingdom of Morocco (via Masen/ONEE)	Private sector project developer or operator (if different)
Evaluation criteria	<ol style="list-style-type: none"> 1) Prequalification – pass/fail outcome mainly based on project experience, financial background and material disputes 2) Projects evaluated on: <ol style="list-style-type: none"> (i) Compliance with technical specification and other tender requirements a pass/fail basis (ii) Price (although wind projects are also subject to certain industrial integration criteria) 	<ol style="list-style-type: none"> 1) Prequalification – pass/fail outcome based on various legal, financial, technical and environment requirements 2) Projects evaluated on: <ol style="list-style-type: none"> (i) Price (70%) (ii) Local economic development (30%)
Financing	Masen/ONEE facilitates concessional debt finance via a consortium of IFIs, guaranteed by the Kingdom of Morocco. Masen has also acquired a 25% equity stake in CSP projects to date and also the related O&M companies.	Bidders are responsible for securing financing for proposed projects, typically sought from domestic and international lenders plus some degree of corporate equity.



Creating a track record

Of particular note is the success of both Morocco and South Africa in applying their respective PPP models to drive the deployment and commercialization of a less mature renewable technology such as CSP. South Africa has seen four projects totaling 400MW of CSP capacity reach financial close between 2012 and 2014, allocated across the first three rounds of its REIPPP program, while a further 200MW awarded to two projects in a dedicated CSP round (3.5) is expected to see financial close later this year.

In Morocco, Masen reached financial close in 2013 on the first 160MW CSP project with storage of its 510MW NOOR Ouarzazate complex, and achieved simultaneous close in May 2015 on the 200MW NOOR Ouarzazate II and 150MW NOOR Ouarzazate III projects (with even higher storage capacity – up to eight hours versus three hours for NOOR Ouarzazate I).

Being bold

According to Auton-Smith, while both markets have been highly successful in spurring CSP deployment, Morocco's model has attracted particular attention given its bold risk allocation strategy for such large-scale and complex projects. Masen has played a critical role in streamlining the procurement process and addressing specific investor risks to establish an effective risk sharing between public and private sector stakeholders. As a dedicated entity taking responsibility for the enablement of utility-scale solar deployment in Morocco, it has demonstrated both confidence in taking on a number of risks often passed to the developer, and competence in delivering on those commitments in a timely manner.

Financing a new approach

What is particularly unique about Morocco's PPP approach for renewables projects is the degree of financing risk absorbed by the offtaker. This has effectively created a new financing architecture that sees both ONEE and Masen act as coordinators and consolidators of concessional debt funding across a range of international finance institutions (IFIs), backed by sovereign guarantees, and then blending loan terms to offer a single project financing package. This is then on-lent to the project vehicle. In the case of solar projects, Masen also provides a minority equity stake, giving Masen a greater degree of involvement and governance across the project life cycle.

The Masen effect

In an exclusive interview, Dayae Oudghiri, Head of Strategy and Development at Masen reveals firsthand the rationale for adopting this particular contracting and finance PPP model and the lessons learned to date (see page 13). Auton-Smith also notes that the

more risk and responsibility a government can absorb – provided it is able to effectively manage those risks – the easier it is for project developers to focus on commercializing and driving down the cost of designing, constructing and operating the asset(s) themselves, while also focusing on plant performance and resilience. On these risks, Masen has held its developers strongly to account in its dual roles of offtaker and senior lender.

Prompting a reduced risk premium and lower transaction costs such a risk allocation should result in much lower bid prices. The PPAs signed earlier this year for phase II and III of the Ouarzazate project, for example, secured peak hour prices of MAD136/MWh (US\$141) and MAD142/MWh (US\$148) respectively, representing some of the lowest thermo-solar power tariffs to date globally. This approach also helps to accelerate technology maturity so that projects can be financed by private investors rather than governments and IFIs going forward.

Getting it right

While the Morocco and South Africa examples illustrate the effective use of PPP-based procurement models with varying degrees of risk transfer to spur both emerging technologies, such as CSP, and more mainstream renewable sources, this is also an increasingly global trend.

Masdar's 100MW Shams One CSP project, for example, again represents the extreme of an almost fully government-led project (albeit with Abengoa and Total each holding 20% stakes), while Abengoa's ability to secure offtake contracts for two 110MW CSP plants in Chile's December 2014 multitechnology auction highlights that private sector-led projects are already able to compete against other energy sources in some markets.

Meanwhile, France is continuing to hold various tenders for both pilot and commercial offshore wind and marine projects based on predefined sites and specific capacities, while offshore projects in the UK and the US have been tendered on the basis of allocated seabed zones assessed and defined by the government (usually with capacity caps per zone). However, for offshore wind projects under the UK's new contracts for difference regime, responsibility for site selection falls entirely on the developer.

Getting it wrong

Lessons can also be learned from the failure of some markets to use competitive bidding effectively to spur the deployment of less mature technologies. China, for example, launched an offshore wind tender program in 2010 but a lack of coordination between government departments over siting resulted in severe delays and site relocations that prevented most projects from being realized. Meanwhile in India, the contracting of eight CSP



projects via reverse auction under phase I of the Jawaharlal Nehru National Solar Mission helped to drive down the cost of CSP to among the lowest levels seen globally, yet financing and policy challenges mean some may still not be built.

While financing is unlikely to be a problem for Saudi Arabia's much-anticipated solar program, an eight-year pushback for achieving its 41GW target on top of already significant delays to the launch of any tenders is damaging developer and investor confidence. Arguably, a less-than-perfect auction system that quickly adapts and improves but starts when planned and when appetite is high, is better than a perfectly designed regime that begins too late or not at all.

A wider phenomenon

It is of course acknowledged that auctions are not only applicable for emerging technologies, but are now the norm for securing PPAs across a wide range of energy sources. These have emerged as a hybrid offtake regime that provides guaranteed revenue streams similar to FITs and FIPs, but also enable targets or a desired technology mix to be met more precisely as with RPOs. At least 60 countries had adopted renewable energy auctions by early 2015, compared to just 6 in 2005. This is also being spurred by regional policies such as the EU's 2014 state aid guidance promoting a gradual move to market-based support (e.g., competitive bidding) to reduce subsidy-based distortions.

Ticking the boxes

For developers and investors, auctions provide much-needed visibility and certainty over future energy demand. For the offtaker, (often the government), one of the main attractions is undoubtedly the ability to leverage price competition and discovery to reduce the cost of energy and achieve a more efficient allocation of resources. Competitive bidding is generating record low prices for renewables projects in a number of markets, increasingly matching or even undercutting the average cost of conventional power. The now frequently cited 100MW phase II of the Mohammed bin Rashid Al Maktoum Solar Park (PV) in Dubai received bids as low as US\$60/MWh in November 2014, while even Brazil's relatively underdeveloped solar market contracted 890MW of PV capacity with an average bid price of just US\$87/MWh. Meanwhile, the average bid price for Brazilian wind projects has tumbled below US\$50/MWh.

However, multiple policy objectives can also be achieved where auction mechanisms incorporate non-price evaluation criteria, such as local industry creation, employment or environmental factors. Auctions allow better energy planning to coordinate associated infrastructure investment, or achieve a desired generation mix. They also enable policymakers to more effectively react to changing market conditions – and to the success or failure of the

auction itself – through amendments to the process or tender rules, compared to more onerous legislative changes to FIT or RPO regimes. South Africa in particular, has demonstrated the ability to successfully implement lessons from initial rounds to improve the efficiency and effectiveness of the program over time.

Competing challenges

Yet there are also drawbacks. Overdependence on auctions to secure PPAs can risk stop-start deployment cycles that may hinder growth across the value chain, particularly where auctions are not part of scheduled program. The complexity, competitive pricing and resource requirements of some auctions can also make it difficult for small or new developers to participate. Even among larger more established developers, overly aggressive bidding in highly competitive auctions increases the risk of that projects become financially unviable. This has been a particular concern in Brazil, India and the UK, for example.

Auction programs in some markets also present a higher degree of binary risk for developers and investors than say, developer-led merchant proposals or direct offtake agreements with energy users. Bidders are often required to invest significant time and resource to develop projects sufficiently to submit credible bids, without any guarantee of securing a contract. Arguably this binary win-lose risk is also higher in tenders for single predefined projects such as in Morocco, compared to where multiple projects of different scales are available, such as in South Africa.

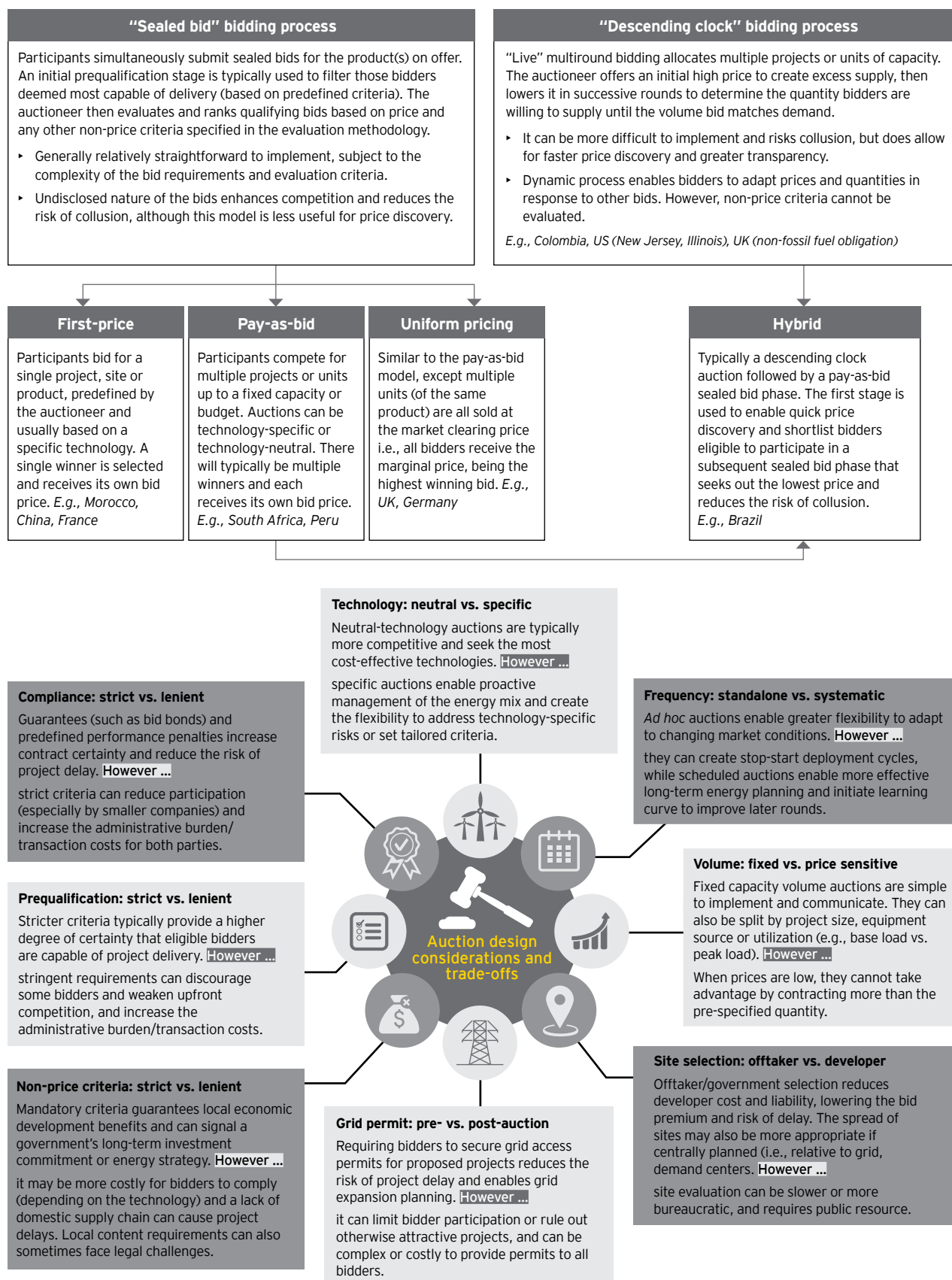
Designing effective auctions

The foundational goals of any auction are arguably always two-fold: (i) ensure sufficient competition to deliver the most cost-effective outcome, and (ii) maximize the likelihood of efficient project delivery by limiting participation to bidders with the relevant capabilities. However, the extent to which these can be achieved will largely depend on how well-designed an auction is relative to a market's characteristics and objectives.

Therefore, while lessons should of course be taken from the success and failure of different auctions programs, each market must still carefully tailor the various aspects of its procurement process. As well as appropriate and effective risk allocation, this can involve potential trade-offs depending on a markets' priorities. For example, (i) achieving the most cost-effective outcome versus achieving specific technology or diversity goals; (ii) reducing entry barriers for bidders yet maximizing certainty around project delivery; and (iii) creating a transparent bidding process yet enabling some degree of complexity to achieve specific objectives or evaluate value of money effectively.

The following page sets out some of the most common auction types and design considerations.

The diagrams below set out some of the most common types of auction and key considerations when designing effective procurement programs.



Setting limits

Ceiling prices and capacity caps can also be used where an auctioneer cannot be certain of a sufficient level of natural competition tension to drive down prices, or simply to act as a useful filtering criteria above which bids will not be considered. They can also provide greater control and visibility over budgets and the pace of capacity buildout.

Ceiling prices can either be discovered through the auction process itself i.e., via a descending clock auction (as in Brazil) or set by the auctioneer (e.g., initial rounds in South Africa). In the case of the latter, however, the tariff must be set very carefully – too high and it fails to act as a useful filter mechanism; too low and otherwise attractive bids could be prematurely discarded. As a general rule, the ceiling price also should not be disclosed. While this can leave bidders slightly blind to the threshold they are being assessed against, it also reduces the risk of competition being artificially eroded as bidders deliberately set prices close to the ceiling to achieve the highest tariffs, as happened in the first round of the South Africa auction in 2011. This was further exacerbated by the lack of capacity caps (beyond the overarching 3.7GW target), weakening competitive tension as demand exceeded supply.

Getting strategic

Project developers themselves must also examine their role in driving forward new utility-scale generation projects. With an increasing number of markets turning to competitive bidding, it's easy for developers to feel the need to bid into every program for fear of missing out. However, a better understanding of the various support models, auction design considerations and lessons learned to date from other markets should enable bidders to think more strategically about the markets and PPP structures most suited to their current and future business models, and take steps to initiate presence and partnerships in those markets. In highly competitive markets, developers and investors may also need to increase self-governance to reduce the risk of underbidding resulting in unviable projects, and seek ways to mitigate binary win-lose risks where bid development costs are high.

Good visibility over tender opportunities will also improve bidder readiness and enable developers to act more strategically. The map on pages 10-11, though not exhaustive, sets out some of the key markets for current and expected procurement activity.

Derisking the market

However, competitive bidding is not the only form of support that is helping to bring forward new utility-scale projects. Commercial risk mitigation can also help to reduce developer risk premiums and focus efforts on commercializing and driving down the cost of new technologies and solutions. In Brazil, South Africa and Peru, for example, power offtake contracts are often indexed to inflation to shield developers from indexation risk, while India is currently considering offering dollar-nominated contracts for renewables projects to reduce developer's currency exchange risk.

Injecting capital confidence

Access to finance can also be a barrier for large-scale energy projects, particularly where perceived risks around unproven technologies or innovative project structures make the private sector unwilling to commit capital without some form of public sector support. Again, Morocco is a good example of how risk mitigation through IFI concessional finance and sovereign guarantees can help reduce bid costs, while favorable funding terms for renewables projects in Brazil via its domestic development bank

BNDES (albeit subject to relatively stringent local content rules) has already helped to create a strong value chain for wind projects, with solar expected to follow suit.

While CSP projects awarded under South Africa's procurement program must generally seek private sector finance, the 100MW Upington CSP tower power project was developed directly by national utility Eskom and fully funded by public and IFI concessional finance totaling US\$1b. Meanwhile, the first phase of Israel's 250MW Ashalim project was the first CSP venture to receive funding from OPIC, the US Government's development finance institution.

In the UK, the government-backed Green Investment Bank is investing in offshore wind farms, typically on commercial terms though still filling a private-sector funding gap that might otherwise exist for such projects perceived to be riskier.

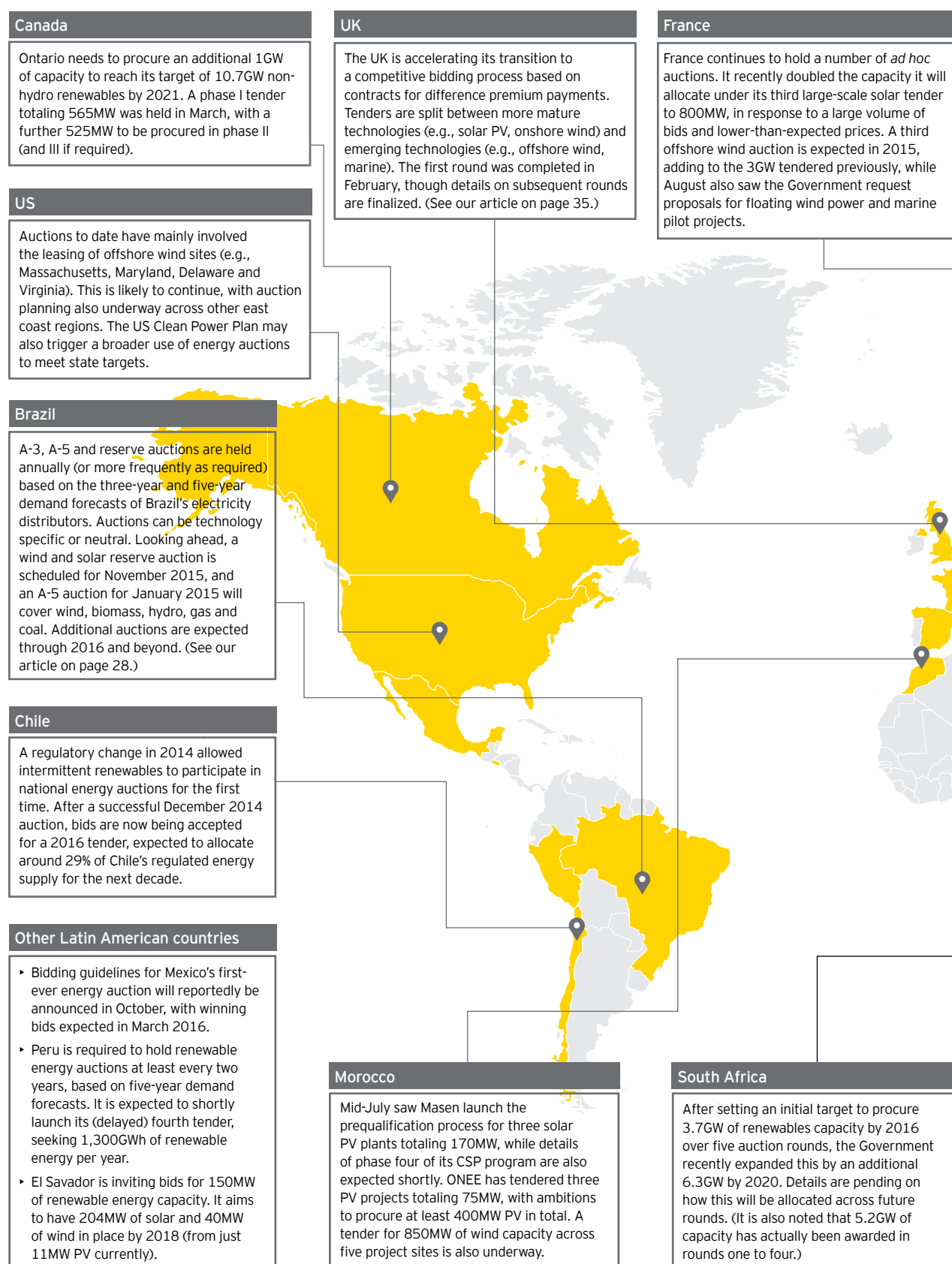
Guaranteeing success

However, risk mitigation can also come in the form of guarantees rather than a capital injection itself. The U.S. Department of Energy (DOE) loan guarantee scheme, for example, is designed to support the commercialization of technologically innovative projects, recognizing that commercial banks and bondholders are often unwilling to finance the initial commercial-scale projects that use a new technology given the lack of credit history or performance records. It has already helped to bring forward major utility-scale projects in the US, including BrightSource Energy's 377MW Ivanpah project – currently the world's largest operational CSP plant – and SolarReserve's 110MW Crescent Dunes solar plant in the Nevada desert, the world's first utility-scale facility to feature advanced molten salt power tower energy storage capabilities.

In an exclusive interview, BrightSource Energy's Senior Vice President of Marketing and Government Affairs, Joseph Desmond, reveals why support for non-mainstream utility-scale renewable energy projects is far from niche (see page 16).



The map below provides a high-level summary of key current and expected renewable energy procurement activity around the world.



Germany

In August, the German Government released draft legislation for the implementation of tendering systems across all renewable technologies from 2017, replacing the current FIT and premium tariff regime. This follows the rollout of a pilot scheme to auction 1.2GW of solar PV capacity between 2015 and 2017, with two (oversubscribed) rounds awarding 300MW already this year.

Turkey

Turkey continues to primarily operate a FIT-based regime but has held a number of *ad hoc* wind and solar auctions. In 2013, 9GW of applications were received for just 600MW of solar capacity on offer, while in May this year, 42GW of applications were submitted for 3GW of pre-licensed wind energy projects. A further 2GW is expected to be auctioned in 2016. (See our article on page 38.)

Other European countries

- ▶ In the Netherlands, 700MW of offshore wind capacity will be tendered annually over the next four years, starting December 2015.
- ▶ Tenders for two offshore wind projects totaling 1GW are already underway in Denmark, while a call for 450MW of near-shore wind capacity is expected in September 2015.
- ▶ Poland recently approved legislation that will shift its renewables power offtake from green certificates to competitive tenders awarding FITs and premiums, from 1 January 2016.
- ▶ Spain is planning a 500MW wind auction covering both new capacity and repowering projects, although no timetable has been disclosed.
- ▶ Russia has delayed its second renewable auction to November 2015.

India

A plethora of federal and state auctions are already underway as part of the Government's push to deploy 100GW and 60GW of solar and wind respectively by 2022. At least 20GW of solar is due to be procured under the country's long-standing National Solar Mission, though numerous more state-based tender programs are expected over the next five years. (See our article on page 32.)

Philippines

In June, the Government announced plans to move away from a quota-based FIT program to an auction process for FIT-eligible resources, once the current FIT allocation targets are met (potentially March 2016).

Other Middle East and African countries

- ▶ Kenya is reportedly considering a switch to auctions from its current "first-come, first-served" FIT policy, though details are lacking.
- ▶ In early July, the Tanzanian Energy and Water Utilities Regulatory Authority also announced it will introduce a competitive auction for solar and wind projects in the near future.
- ▶ Jordan's second solar tender of 200MW returned record-low tariffs in the first half of 2015, potentially spurring demand for further rounds.
- ▶ The UAE's 3GW Mohammed bin Rashid al Maktoum Solar Park in Dubai will sustain auction activity in the short to medium term, with the third 800MW phase tender expected later this year. The record-breaking phase two US\$60/MWh bid also means tenders are likely to be the preferred model in the region for the foreseeable future.
- ▶ Saudi Arabia's 41GW solar program will offer significant tender opportunities, but continues to be plagued by delays.

Egypt

Following its inaugural tender of 4.3GW of renewables capacity in January 2015, Egypt has recently invited bids for three tenders totaling 500MW, comprising a single wind, solar PV and CSP project. Given the momentum behind the country's renewable energy expansion since late 2014, further renewables auctions are expected going forward.



Expecting the unexpected

It has been widely expected that the unstoppable march toward renewable energy grid parity would accelerate the dawn of a post-subsidy era in which policy-induced market distortions will disappear and supply and demand will determine the most efficient allocation of energy resources. However, while renewable energy is already fulfilling much of its potential to deliver large-scale generation at least cost, it is likely to be emerging technologies that will be best placed to deliver utility-scale projects that can meet often challenging energy demand profiles and overcome – or at least complement – the limitations of more mainstream renewables such as onshore wind and solar PV.

However, with most energy sources historically having required some form of support, it's no surprise this puts the spotlight on determining the most effective delivery models. It is of course acknowledged that not every market will need to, or be able to, take advantage of emerging technologies, though the basic principle of designing support or enablement measures that minimize distortions and provide the market with clear signals will apply in any market trying to achieve multiple energy objectives. Individual market characteristics will inevitably determine the most appropriate delivery model, although leveraging the potential of a wide range of PPP-based support schemes to drive down prices through risk mitigation and re-allocation, is already proving to be an effective way to bring forward large-scale projects in many markets.

Know your risks

Successful implementation of such PPPs – from competitive bidding to government-backed loan guarantees – still requires careful consideration of which parties are best placed to absorb different risks in light of a market's characteristics and the trade-offs that might be required when designing programs. In many markets, the private sector will be able to absorb the various development, delivery and financing risks effectively, particularly where projects are typically smaller or there is less emphasis on targeting specific technologies, such as in South Africa and Brazil.

However, these risks – and the associated costs – become more burdensome as projects become larger or technologies less mainstream. Some markets may therefore seek to replicate the success of Masen in confidently reallocating risks to crystalize its goal of reducing project barriers and driving down costs.

Either way, far from seeing new utility-scale generation projects as simply being about the construction of additional megawatts, policymakers, developers and investors should view PPP-based projects as a means of creating sustainable long-term industries, and establishing the common goal of using effective risk allocation to reduce technology and transaction costs. In short, the financial optimum is not necessarily always the economic optimum when it comes to utility-scale energy generation.

Perhaps one day, different energy sources will truly compete on a level playing field and the market can be left to its own devices. Until then, however, let's just try to optimize the role of policy in bringing forward new utility-scale energy generation.

To find out how EY can support your emerging technology transactions or procurement programs please contact:

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In an exclusive interview with Dayae Oudghiri, Head of Strategy and Development at Masen, we find what makes its solar program so unique and the lessons that can be learned.



Dayae Oudghiri

Masen Management Board Member

Dayae leads the Strategy and Development team executing Masen's NOOR solar program. She also heads the company's Steering, Partnerships, Business Intelligence and Communication divisions. Dayae has been with Masen since its creation in 2010, when she first started as an Advisor to the President of the Management Board. Her prior experience includes positions at Société Générale in Paris and Caisse de Dépôt et de Gestion, Morocco's leading financial institution.

Masen: an overview

The Moroccan Government established the Moroccan Agency for Solar Energy (Masen) in 2010 as the vehicle in charge of the implementation of the Moroccan Solar Plan, NOOR, which targets a minimum capacity of 2GW by 2020. Masen aims at the valuation of local solar resources while contributing to Morocco's energy security, respecting future environmental imperatives and crystalizing the foreseen socio-economic opportunity.

In particular, Masen's aim is to deploy generating capacity, but also to support the development of a new industrial sector in Morocco through training, resource building and R&D.

Masen is a limited company with four shareholders each owning 25%: the Government of Morocco; the national utility ONEE; and two state-owned entities, Fonds Hassan II and Société d'Investissements Energétiques.

interview

What is unique about Masen's approach?

Masen is a dedicated entity that is able to coordinate and streamline the entire procurement process for bidders, facilitating the most efficient and timely award of contracts to develop and operate utility-scale solar in Morocco, based on the most effective allocation of risks.

The result is a unique scheme whereby Masen, in addition to designing and executing the solar bidding process, is at the same time offtaker of the electricity produced, provider of the land, sole lender, minority shareholder and provider of common infrastructure.

In providing the land, Masen effectively takes responsibility for site selection, usually a cost and risk incurred by developers. We conduct initial environmental and socioeconomic impact assessments for each project site and provide prequalified bidders with all the relevant information for that site (e.g., geotechnical, topographic, hydric, seismic and irradiation studies). We also grant grid access with ONEE for the selected sites, again, often a bidder risk.

Masen is a dedicated entity that is able to coordinate and streamline the entire process for bidders.

Masen also takes responsibility for managing and investing in infrastructure and services associated with the selected sites, such as roads and water access. Critically, all these roles are well tied-in with a clear risk allocation translated into the relevant contractual documents.

And what about the financing structure?

Masen provides both debt and equity to projects, taking a direct stake in the project (usually 25%) and securing concessional finance from a consortium of international finance institutions (IFIs), which is then on-lent to the successful developer as a single financing package.

This innovative financing scheme has arisen as a very competitive alternative to classic project financing for solar projects given the low interest rates offered. This has in large part been made possible thanks to the strong involvement and support of the Moroccan State, which is guaranteeing the concessional loans provided.

The Government was also able to secure this high level of IFI support because solar projects in the country are perceived as strategic to help to spur technology improvements, jobs and industry creation, not only in Morocco but across the world. It is hoped that this will galvanize private sector investment in such projects going forward as the concept becomes more proven.

The development of a national solar plan (NOOR) with a clear and stable vision for the next decade has therefore been a valuable asset to draw in IFI support. The sheer size of the project also helps – at more than 500MW, the NOOR Ouarzazate complex will be one of the largest solar projects in the world.

In addition, the IFIs trusted Masen's capacity to launch and conduct large and complex projects, and coordinate the various funding parties across all aspects of the projects.

Indeed, we had a clear and transparent approach, stuck to our own timelines, and were very passionate. While we shared ideas with the IFIs and secured valuable feedback, we also implemented a sustained flow of stakeholder actions given decisions were required on a daily basis. This helped us to quickly establish credibility with the IFIs early on, and created the foundations for a trusting relationship that further developed over time.

What is the rationale for adopting this particular contracting and financing model for Morocco's solar projects?

We thought this structuring would result in the most effective solar electricity at the optimal cost, which is exactly our role. We always kept in mind that a risk allocation allowing each party to bear the risk that it controls best, would optimize the tariffs and attract the right stakeholders.

Indeed, this innovative scheme offers several layers of optimization that have made it possible to reach a more competitive price per kWh. With Masen

This innovative scheme offers several layers of optimization that have achieved a more competitive price/kWh.

absorbing a number of risks that are usually borne by the developer but that we could control better, such as site selection, grid access and financing, we have been able to reduce transaction costs and the risk premium priced into bids, as well as the cost of financing itself.

Offering bidders a single entity that manages all aspects of the program, from market sounding through to the financial close of the projects, has also created timing and transaction efficiencies. The combination of a more streamlined process and lower risk profile has enabled bidders to mainly focus on offering value for money and the best quality technical solutions.

As minority shareholder in the project companies and in the vehicles dedicated to the operation and maintenance of the plants, Masen is also able to follow its projects closely and deepen its knowledge on the solar value chain, to the benefit of future projects and Morocco's energy sector more broadly.

A double PPA structure also allows Masen to maintain its coordinating role across all aspects of the program. A direct PPA with the project company establishes Masen as the sole offtaker of electricity generated by the facility, while a second PPA then allows Masen to sell that power straight on to ONEE and recover any difference in tariffs from the Government of Morocco.

Why choose CSP given it is typically a more costly and complex technology solution?

It is important to remember that Masen is technology-agnostic. In implementing the NOOR solar plan, Masen is combining complementary solar technologies to provide the most appropriate solutions relative to the identified needs of the Moroccan energy market, while also optimizing the overall cost per kWh and maximizing synergies.



NOOR is a multi-technology plan so that it can provide the most appropriate solutions to meet Morocco's needs.

On the one hand, using CSP technology with storage offers Morocco and ONEE significant flexibility through very large-scale dispatchable plants, and enables it to better meet its peak hours demand (after sunset). On the other hand, PV technology is expected to offer tailored solutions for specific needs through mid-sized plants, including affordable solutions to reinforce the limits of the national grid, to meet auxiliary feeding needs for CSP plants and to serve high electricity consumption zones due to extended economic activities. Masen has already launched the prequalification process for the 170MW phase of its NOOR PV program.

What is Masen's position on local content obligations?

Local content is not a mandatory requirement or exclusion criteria for project selection; however, the tender document does invite bidders to secure a minimum of 30% of the plant's capital cost based on local industry.

This has, of course, been done in accordance with all the guidelines and rules of the international institutions supporting Masen. It is also in the interest



NOOR 1 CSP plant, Ouarzazate, Morocco.
Photo courtesy of Masen.



of Morocco, and the project developers, to leverage domestic content to spur local industry creation and economic development.

Two studies were conducted to assess how much industrial integration could be expected without distortion of competition. This produced an indicative minimum figure of 30%, although the successful consortiums to date have indicated a higher proportion can be achieved.

To what extent was the private sector involved in shaping the process?

Given its initial lack of CSP experience (and that of the financial institutions supporting the program), Masen undertook prefeasibility studies to determine the most appropriate size and type of CSP technology to be tendered. We also established dialogue with the private sector through various market soundings to better understand the technical requirements, in turn reducing the risk of project failure and building up a knowledge base and technical specifications for future tenders.

The flexibility and adaptability of market players to match the risk allocation proposed was a welcome surprise, though we were expecting no less.

Similarly, while specific PPA terms are finalized on a project-by-project basis, Masen still used written dialogue and Q&A sessions with bidders during the tender processes to help reduce uncertainties, if any, for the qualified consortia, and further clarify the retained risk allocation and the overall process.

Has anything surprised you?

The flexibility and adaptive skills displayed by market players to match the risk allocation proposed, and their efforts to come to the table with innovative solutions that match Masen's requirements and objective, also on a relatively tight timeframe, was a welcome surprise, though we were expecting no less. It was also great seeing five IFIs simultaneously fully mobilized for our projects.

Far from just building assets, bidders seem keen to support the objectives pursued by the Kingdom of Morocco, including, among other things, the creation of a competitive industry and the promotion of innovation to strengthen operators across every segment of the country's renewable energy sector, and the solar sector in particular. The same also applies to the IFIs.

This has further encouraged Morocco to develop a framework based on clear and rapid international tendering that provides bidders with the visibility required for ambitious action by the private sector in the best possible condition.

What advice would you give to other governments considering this type of contract/financing structure?

This approach will be most successfully replicated in countries where clean energy programs are strongly supported by the state and where IFIs are willing to finance such projects in concessional conditions.

In this context, key aspects include:

- ▶ An appropriate institutional and legal framework is needed.
- ▶ A dedicated entity with relevant powers can help speed up program implementation and project delivery.

This model relies on a competitive market whose actors support the approach and are fully involved.

- ▶ Once the objectives pursued are defined and translated into operational targets, communication to the various stakeholders on key aspects of the programs will increase the visibility of the developers.
- ▶ Exchanges with the market on key features of the projects or process before setting them will help structure opportunities that are attractive to market players.
- ▶ Launching an international open tender process with a clear and fair risk allocation translated in relevant contractual documents will ensure the lowest possible cost while also making sure that the assets developed will comply with the best international standards.

However, it should be noted that this model also relies on a competitive market whose actors volunteer to support this approach and are fully involved to explore the opportunities to help build a competitive solar industry.

We are very keen to share with other countries the lessons learned for the successful development of their own solar programs. Masen has developed a full set of best practices (including on environmental and social aspects) and will always be willing to share these with countries seeking to develop robust programs to achieve greater energy diversity, while offering their economy a new growth opportunity.

For more information on Masen's activities or the NOOR solar program, please contact:

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Providing a view from the market, Joseph Desmond of BrightSource Energy reveals why support for non-mainstream utility-scale generation projects is far from niche.



Joseph Desmond

Senior VP of Marketing and Government Affairs, BrightSource Energy

Joseph brings more than two decades of private and public energy sector experience to his role at BrightSource Energy, where he oversees communications, marketing, and government and regulatory affairs. Prior to BrightSource, Joseph served in numerous executive roles under former California Governor Arnold Schwarzenegger, including Chairman of the California Energy Commission.

Is there still a role for government in bringing forward new utility-scale projects?

Government has always employed a variety of incentives to encourage the development of all energy resources. These represent nothing less than the lifeblood for emerging technologies to succeed in the long run.

For example, government policies – in particular, federal R&D funding, public-private demonstration projects and production incentives – played a role in advancing some of the key innovations required to unlock US shale gas reserves. Here, government support over time, in concert with the significant private sector investment that it helped to galvanize, has resulted in a complete market shift that is now contributing to a dramatic increase in US energy production.

We're now seeing the same thing happening with renewable energy technologies, but at a much faster pace. In much the same way as shale gas, policies that support new technologies along various stages of the value chain, such as the DOE loan guarantee program and the SunShot Initiative, are paying off for taxpayers – for example, a recent DOE report projected that taxpayers will earn US\$5b in interest as loan guarantee projects are paid back.

What do you see as the most effective form of support or enablement going forward?

There are many forms of renewable support structures available and what is effective for

one country may not be as effective for another. The choices depend on the policy objectives of the government and the type of investment behavior the government wishes to incentivize. Additionally, development costs for the same technology can vary geographically, including by permitting jurisdiction and by applicable labor rates.

To its credit, South Africa has relied on best practices learned in other renewable markets to guide its procurement program design and implementation. Additionally, it gives considerable weight to non-price factors, such as job creation, local content, enterprising and socioeconomic development. Fortunately, the components needed to construct CSP plants easily lend themselves to high levels of localization.

In the US, meanwhile, policies such as renewable portfolio and fuel standards helped drive market demand for renewables capacity, although policy continues to influence the financial returns across all types of energy, including sectors that are far more mature than renewables. Thus policies, such as the investment and production tax credits, have helped level the playing field for renewables against other energy sources with their own favorable, long-term and permanent tax treatments.

Regardless of the support mechanism, however, it's policy consistency and clarity that most effectively builds confidence and attracts capital.

CSP will receive more attention from governments that recognize its potential for localization.

About BrightSource

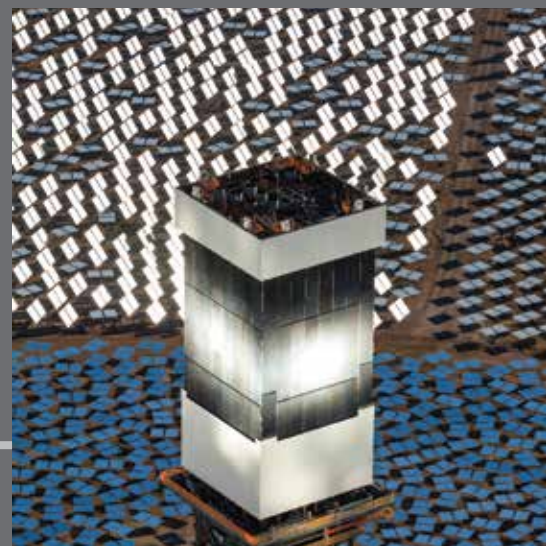
BrightSource Energy, Inc. designs, develops and deploys solar thermal technology to produce high-value electricity and steam for power, petroleum and industrial-process markets worldwide.

Headquartered in Oakland, California, BrightSource Energy is a privately held company with operations in the United States, China, Europe, Israel and South Africa.

In 2013, the company commissioned the 377MW Ivanpah Solar Electric Generating System in the Nevada desert, currently the world's largest operating CSP plant.

Market commentators are increasingly dismissing CSP as too expensive and niche. What is your response?

As CSP is becoming better understood, utilities are starting to recognize the attributes that make it attractive, particularly as the intermittency of PV and wind at scale are becoming a larger issue. CSP combined with thermal energy storage transforms a variable resource into a flexible, dispatchable generator able to release energy when it is needed most, or provide continuous power for energy-intensive industries. This dispatchable power can improve reliability and reduce integration costs, while also supporting higher levels of other variable renewables. BrightSource is working with a number of utilities to design optimal solutions that meet specific load profiles.



Ivanpah CSP complex – Mojave Desert, California, US. Photo courtesy of BrightSource Energy.

“Solar augmentation” of existing fossil fuel plants can offer a lower cost alternative to stand-alone solar plants.

CSP is also able to ride through changes in weather patterns much more smoothly due to thermal inertia, as well as providing voltage support. Further, it provides “solar steam,” which can be hybridized with existing or new gas or coal plants as a way to reduce carbon intensity or boost efficiency during certain times of the day. The “solar augmentation” of existing fossil fuel power plants can offer a lower risk and lower cost alternative to constructing stand-alone solar plants.

In addition to generating electricity, CSP technology is an enabler for a much larger value chain. Other applications include desalination, mining and other industrial processes that require constant pressure and steam temperature, such as enhanced oil recovery. The latter is an area where BrightSource is already applying its solar thermal technology.

How has BrightSource benefited from government support?

The landmark 377MW Ivanpah project is a textbook example of how tax policy, energy policy, land-use policy, climate policy and environmental stewardship can work together to deliver on a technology’s promise; the DOE loan guarantee program was a critical enabler that helped make this project a reality.

BrightSource first applied for a loan guarantee in 2006. Following four years of comprehensive review, the Federal Financing Bank extended the Ivanpah project companies a US\$1.6b loan in April 2011, which was guaranteed by the DOE. Although BrightSource was the project sponsor of Ivanpah, the borrower under the DOE-guaranteed loan is actually the special purpose project company itself, owned by NRG, Google and BrightSource. The project company holds the long-term, fixed-price PPAs with California utilities PG&E and SCE. The underlying loan is fully secured by the project company’s physical assets and contracts.

The terms of the DOE loan required that it be repaid, with interest, using the funds awarded under the 1603 Treasury Grant program, simply the cash equivalent of the federal 30% ITC available to eligible solar projects operational by the end of 2016.

What is your outlook for the US CSP market?

US CSP deployment experienced a few years of intense growth, with government support such as the SunShot Initiative and DOE loan guarantee program helping to move the technology from demonstration to commercial scale. However, abundant cheap shale gas and the success of PV-based distributed generation solutions has reduced the focus on the technology in recent years.

But, as the penetration levels of renewables increases in the US, policymakers and utilities are showing growing interest in technologies that can ensure long-term reliability without increasing emissions. CSP with thermal energy storage is therefore attracting increasing attention as a flexible resource to help address the supply variability introduced by rapidly expanding wind and PV production.

We therefore believe the US market for CSP (plus thermal energy storage) will rebound in the near term as a result of:

- ▶ Growing requirements for flexible, reliable clean energy
- ▶ Implementation of the EPA’s Clean Power Plan, which will drive further retirements of fossil fleet and create opportunities for CSP, including hybridization
- ▶ Expected increase of California’s renewable portfolio standard to 50%
- ▶ Further reduction of a financing risk premiums via successful technology deployment in other countries

The US market will also be in a good position to take advantage of lower costs and better performance for CSP technology, having since been deployed in projects around the globe.

Which other markets do you expect to offer the most exciting opportunities for utility-scale projects over the next few years?

Flexible, dispatchable resources such as CSP (with thermal storage) will be needed in order for many countries to achieve their economic, energy and environmental goals while maintaining grid reliability. It will also receive more attention from governments that recognize its potential for localization.

South Africa is a particularly exciting area across all renewable technologies. The country is implementing the largest renewable energy program on the African continent to diversify its energy mix, which has historically been dominated by coal.



Ivanpah CSP complex – Mojave Desert, California, US. Photo courtesy of BrightSource Energy.

China is also looking to develop CSP with storage to complement its existing commitment to wind and solar PV – the Government recently increased its target CSP allocation from 3GW to 10GW by 2020. BrightSource’s partnership with Huanghe Hydropower and Shanghai Electric to develop the proposed Huanghe Qinghai Delingha Solar Thermal Power Project – comprising six towers at 135MW each and China’s first commercial-scale CSP project that also incorporates storage – is representative of the types of projects intended to be developed to meet this goal.

Latin America, India and the MENA region also represent great opportunities for large renewables projects.

As a technology developer, what are the critical success factors when entering a new market?

Every country with a long-term commitment to promote a low-carbon economy expands the opportunities for clean energy technology, environmental protection and job creation for their citizens. When we enter a new market we look for:

- ▶ Partnering with strong local companies
- ▶ Technology innovation and cost reduction
- ▶ Recognition of the value of CSP plus thermal energy storage globally and its importance to renewables integration
- ▶ A comprehensive IP strategy
- ▶ Confidence in a long-term commitment to a low-carbon economy

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Key developments

Country-specific highlights

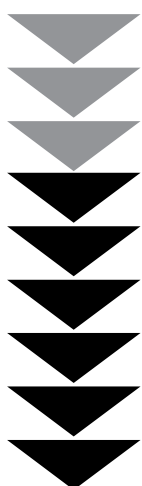
Hot



Chile chooses cheap. The success of renewables projects in helping to drive down average energy prices in Chile after a landmark decision last year to allow intermittent energy supplies to compete with traditional power plants in the country's national energy auctions, has prompted a call for renewables to account for at least 45% of power contracted in future tenders. With bids already being accepted for a May 2016 auction, recent months have seen a flurry of activity in this already buoyant market, with SunPower Corp, Alstom and Brightsource, SunEdison and Enel Green Power, to name a few, all announcing major project developments in the country.

France finish line. Late July saw France finally adopt its long-awaited energy transition law to reduce the proportion of nuclear from 75% to 50%, generate 40% renewable electricity by 2030 and overhaul its subsidy regime. July's legislation also included a last-minute amendment to increase the carbon target price. This follows an announcement in May that saw France become the first country in the world to introduce a carbon reporting obligation on financial institutions. The Government also recently launched tenders for floating offshore wind and marine energy pilot projects, and doubled the capacity of solar PV to be tendered in 2015 to 800MW.

Mexico momentum. Mexico has confirmed that it will create a market for tradable renewable energy certificates, to be introduced from 2018 into the wholesale electricity market, itself due to be launched in December 2015. This has added another jolt of momentum to Mexico's already burgeoning renewables market, with major international players such as SunPower Corp. and AES announcing joint ventures to develop large-scale wind and solar projects. Late July also saw 450MW of new geothermal prospects allocated to the Federal Electricity Commission, helping exploit the country's estimated 13.4GW of geothermal potential.



Not

Australia wind war. Just as agreement on a reduced renewable energy target sparked a glimmer of hope of some near-term certainty for Australia's battered renewables market, the Government issued a draft directive prohibiting the A\$10b (US\$9b) Clean Energy Finance Corporation from investing in onshore wind and rooftop solar, stating it should only back "new and emerging technologies." A government-commissioned inquiry has also prompted a series of recommendations to reduce support for wind projects. This is at odds with the Government's more recent positive stance on utility-scale solar, arguably far from an "emerging" technology, thereby creating mixed signals.

Spain storage woes. The solar sector is reeling from a shock government plan unveiled in June to tax residential self-consumption of solar power that utilizes battery storage, and remove net metering payments for such systems. Meanwhile, the lack of new wind capacity in the first half of 2015 has renewed warnings that Spain will fail to meet its EU 2020 target, with the Government's latest draft Energy Reform Bill indicating at least 5GW and €7b (US\$8b) of new investment is required. Even plans for a 500MW tender this year may not restore investor confidence unless reforms address the issue of reasonable returns.

UK policies unravel. The renewables sector will be wishing the UK Government had taken an extended holiday between June and August. A raft of policy revisions that are likely to dramatically slow deployment across a range of technologies have been rushed through (apparently on the grounds of affordability), while a pro-nuclear, offshore wind and shale gas stance has left investors wondering what the Government is actually trying to achieve and what evidence, if any, is being used to inform current policy (see our article on page 35).

Deal, investment and policy highlights

The great coal escape. The fossil fuel divestment trend looks set to continue, with a number of high-profile announcements in recent months reinforcing that climate change concerns have gone truly mainstream. Norway's US\$900b sovereign wealth fund – the world's largest, holding on average more than 1% of all listed shares globally – is to divest billions of dollars from coal following a decision to ban investments in companies with a greater than 30% stake in coal-based activities or revenues. The fund is currently one of the top ten investors in the global coal industry. Other announcements include French insurer AXA committing to sell off €500m (US\$553m) of coal holdings by the end of this year, the first big financial institution to take such a step, and reports that major utility Engie is planning to sell more than US\$1b worth of interests in Asian coal-fired power plants.

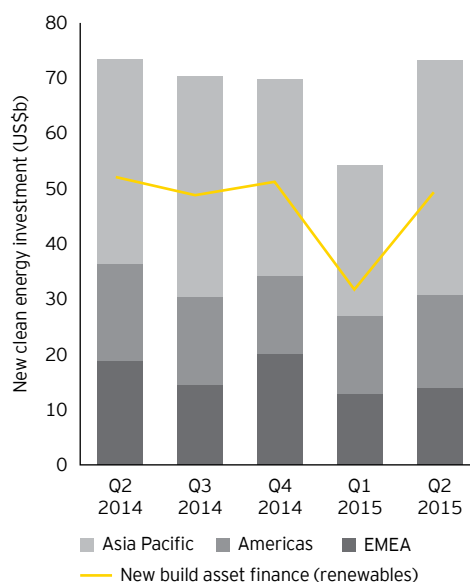
Getting organized. Such divestments reflect a broader trend of corporate restructuring and portfolio optimization as companies try to adapt to an energy sector in transformation. General Electric is the latest to undergo a major reorganization, committing to sell off the majority of GE Capital – its vast US\$500b financial-services empire – to refocus on its core industrial business. However, in retaining GE Energy Financial Services, a major investor in renewables globally, the group has sent strong signals that it expects clean energy to become a more significant part of its portfolio. Meanwhile, Spanish banking giant Santander has joined with two Canadian pension funds to launch Cubico Sustainable Investments, a US\$2b renewable energy and water fund with a global remit, and Italian utility Enel has committed to invest around 53% of its US\$8.8b renewables budget in Latin America through to 2019.

Buying success. Various portfolio restructurings are also underway in the form of strategic M&A or JV activity. In early July, for example, SunEdison and Gamesa announced a 50:50 JV to develop up to 1GW of wind capacity by 2018, singling out Mexico and India as specific markets of interest. SunEdison also plans to acquire Vivint Solar, the second-largest US installer of rooftop PV, in a US\$2.2b deal that it claims will make it the world's leading distributed solar company. Meanwhile, US investment group KKR, which has around US\$99b of assets under management, is to purchase an 80% stake in Spain's Gestamp Solar in a deal that values the business at around US\$1b. It's also further evidence of the appetite for renewables among major global finance institutions.

EU on the tracks. It's also been a busy few months for policymakers in Europe. In mid-July, the EU unveiled plans to galvanize the bloc's failing emissions trading scheme by increasing the post-2021 annual allowance depression rate to 2.12%. It will also create a €10b (US\$11b) Innovation Fund to support "first-of-a-kind" investments in renewables and other low-carbon technologies. Ambitions for a new energy market design were also announced, including the possibility of converging renewable energy support schemes across borders, with legislation to be drawn up in 2016. This came a month after 13 Western and Central European energy ministers signed a joined declaration agreeing to regional cooperation on power supplies. June also saw the release of the European Commission's biennial progress report on the EU's 2020 renewable energy targets. It revealed that, while the bloc as a whole is on track to achieve its 20% goal, several countries are lagging behind and may not meet their individual targets, including France, UK, Netherlands and Poland.

New clean energy investment worldwide, Q2 2015

Global new investment in clean energy totaled US\$73.5b Q2 2015, taking the total for the first half of the year to US\$127.9b and down only 3% on the same period last year. China and India were the main markets to see uplifts compared to the same quarter last year – new investment in India increased 75% to US\$2.2b compared to China's 15% increase, though China remains far and away the front runner in absolute terms. Additional investment of US\$27.9b in Q2 2015 was more than that in Europe and the US combined, both seeing roughly US\$12.5b of new investment, representing a 3% increase for the US and 23% reduction for Europe on the same period last year. Once again, solar dominated the quarter, attracting US\$41.9b of new investment, compared to US\$27.8b for wind.



Source: BNEF project database and *Global trends in clean energy investment – Q2 2015 fact pack*, BNEF, July 2015. Values include BNEF estimates for undisclosed deals. Asia-Pacific includes India.

Our index

RECAI scores and rankings at September 2015

(See page 42 an overview of the RECAI methodology.)

Rank	Previous ranking	Market	RECAI score	Technology-specific indices rankings							
				Onshore wind	Offshore wind	Solar PV	Solar CSP	Biomass	Geothermal	Hydro	Marine
1	(2)	US	75.0	2	8	1	1	2	2	3	8
2	(1)	China	74.2	1	2	2	6	1	12	1	16
3	(4)	India	65.9	3	16	3	5	15	14	9	11
4	(3)	Germany	65.7	6	4	6	27*	8	13	15	27
5	(5)	Japan	63.2	18	9	5	26	4	4	4	10
6	(6)	Canada	60.8	4	13	11	23	13	18	5	6
7	(7)	France	59.9	7	7	9	27*	9	15	12	4
8	(9)	Brazil	58.2	5	25	8	8	3	32	2	24
9	(11)	Chile	56.3	19	22	4	2	21	8	17	14
10	(12)	Netherlands	55.1	11	3	26	27*	10	24	32	30
11	(8)	UK	55.0	13	1	16	27*	7	20	25	5
12	(13)	South Africa	54.9	15	28	7	3	33	35*	18	19
13	(10)	Australia	54.2	23	19	10	12	20	10	24	12
14	(14)	Belgium	53.4	26	6	20	27*	11	21	29	31*
15	(17)	Turkey	53.1	9	24	24	11	34	6	6	20
16	(15)	South Korea	52.0	21	14	12	24	12	28	16	1
17	(16)	Italy	51.9	27	21	14	14	14	9	14	23
18	(18)	Denmark	51.8	12	5	34	27*	16	35*	36	17
19	(20)	Mexico	51.5	14	30	13	17	31	7	30	21
20	(19)	Sweden	51.2	10	11	36	27*	6	26	11	13
21	(21)	Portugal	50.4	25	20	25	21	24	17	20	9
22	(22)	Thailand	50.0	34	39	17	25	17	29	35	29
23	(25)	Morocco	49.7	24	34	15	4	38	35*	39	31*
24	(23)	Taiwan	49.5	31	17	19	22	25	19	21	26
25	(24)	Spain	48.0	28	26	23	13	27	34	34	15
26	(26)	Poland	47.8	20	18	33	27*	19	16	23	31*
27	(28)	Peru	47.3	36	27	21	16	29	11	7	31*
28	(30)	Ireland	47.0	8	12	37	27*	22	33	31	2
29	(27)	Austria	46.9	22	40	31	27*	18	22	13	31*
30	(29)	Israel	46.1	38	37	18	7	37	35*	28	22
31	(33)	Kenya	46.0	30	33	27	15	30	3	26	28
32	(31)	Philippines	45.5	33	29	30	19	26	5	19	3
33	(32)	Norway	45.2	16	15	39	27*	28	27	8	7
34	(34)	Romania	44.8	29	31	35	27*	32	25	27	31*
35	(37)	Egypt	44.3	32	36	31	9	40	35*	37	31*
36	(38)	Saudi Arabia	44.0	35	38	22	10	39	30	40	31*
37	(36)	Finland	43.9	17	10	40	27*	5	35*	33	31*
38	(39)	Indonesia	43.3	39	32	29	20	23	1	10	18
39	(40)	Russia	42.0	37	23	38	27*	36	31	22	25
40	(35)	Greece	41.8	40	35	32	18	35	23	38	31*

*joint ranking

Index highlights

A year after losing the RECAI crown to China, the **US** has once again risen to the top of the index as it rolls out what is arguably its most coherent, flexible and strategic piece of energy legislation in decades. While partisan politics and entrenched fossil fuel interests will inevitably cast some clouds over President Obama's Clean Power Plan (CPP), it still represents a much-needed long-term national framework that could accelerate the shift to a low-carbon economy – one that will be under international as well as domestic scrutiny. (See our article on page 24.)

China's five-year outlook for additional wind and solar installations is still double that of the US, reflecting the magnitude of the investment and deployment opportunities that are being driven by the fundamentals of surging energy demand and an environmental imperative. Further, few could accuse China of not delivering on even its most ambitious renewables targets given its performance to date. However, evidence of foreign and private developers accessing this vast market remains limited despite government liberalization efforts, and a weakening economy is also dampening the outlook. Further, while installations in the country continue to soar, so do curtailment rates, with grid issues idling 15% and 9% of wind and solar generation respectively in the first half of the year. As a result, China slips to second place in the index.

China may also soon find its status as Asia's resident index leader challenged by **India**, which moves up to third place this issue ahead of Germany. While a significant number of challenges still stand in the way of India achieving its ambitious 175GW renewables target by 2022, the Government is being relentless in rolling out policy measures to increase the country's attractiveness. And based on the almost continuous flow of big ticket projects, deals and funding commitments by major domestic and international investors and developers, it seems to be working. (See our article on page 32.)

India's rise up the rankings pushes **Germany** down to fourth place. A major slowdown in capacity deployment and mixed reactions to the new auction regime also contributed to Germany's reduced attractiveness. While the two PV tenders held this year were oversubscribed – part of a pilot for a broader auction system that will take effect in 2017, on which a consultation was launched in July this year – the low volume of capacity actually awarded makes it likely the country will miss its annual 2.4GW to 2.6GW solar target for the second year. Further, the shift to tenders has raised fears that small-scale and community-based projects will be squeezed out.

However, even in fourth place, Germany remains the jewel in Europe's renewable energy crown, enjoying a relatively high degree of government support and policy stability, and still boasting the highest solar capacity in the world, with 38.9GW installed by the end of June 2015.

A barrage of severe and, in some cases, totally unexpected policy revisions impacting most segments of the **UK's** renewables industry has prompted an equally dramatic three place fall in the index to 11th position, taking the UK out of the top 10 for the first time in RECAI's 12-year history. The measures – some proposed and some mandated – have left many perplexed as to what the future now

holds for a renewables sector that has already been plagued by uncertainty and policy U-turns over the past two years, increasing the likelihood of an investor exodus from the UK energy market. (See our article on page 35.)

The UK's fall sees **Brazil** and **Chile** jump up to eighth and ninth place respectively, though both markets also boast strong and increasing development pipelines as high capacity factors, the need to displace expensive diesel-fired power and structured competitive bidding regimes continue to make renewables a cost-competitive proposition backed by strong government support. (See our article on page 28 and "Key developments" section on page 18 for more on Brazil and Chile respectively.)

While **Turkey's** renewable energy sector is growing at a slower pace than expected, potentially exacerbated by current macroeconomic uncertainties and grid access issues, strong government targets announced in early 2015 and significant oversubscription of both past and future tenders indicate high levels of appetite for renewables investment and deployment in the country. A current account deficit largely caused by high-cost gas imports is also expected to accelerate growth in the sector, contributing to Turkey's rise to 15th place. (See our article on page 38.)

Clarity over **Mexico's** proposed long-term renewable energy support regime (see the "Key developments" section on page 18), combined with a broader energy policy overhaul that is opening up the market to private investors and developers, is already galvanizing numerous large-scale projects and prompting a series of joint ventures with international partners establishing long-term deployment strategies in the country. As a result, Mexico continues its ascent in the index, moving up to 19th place.

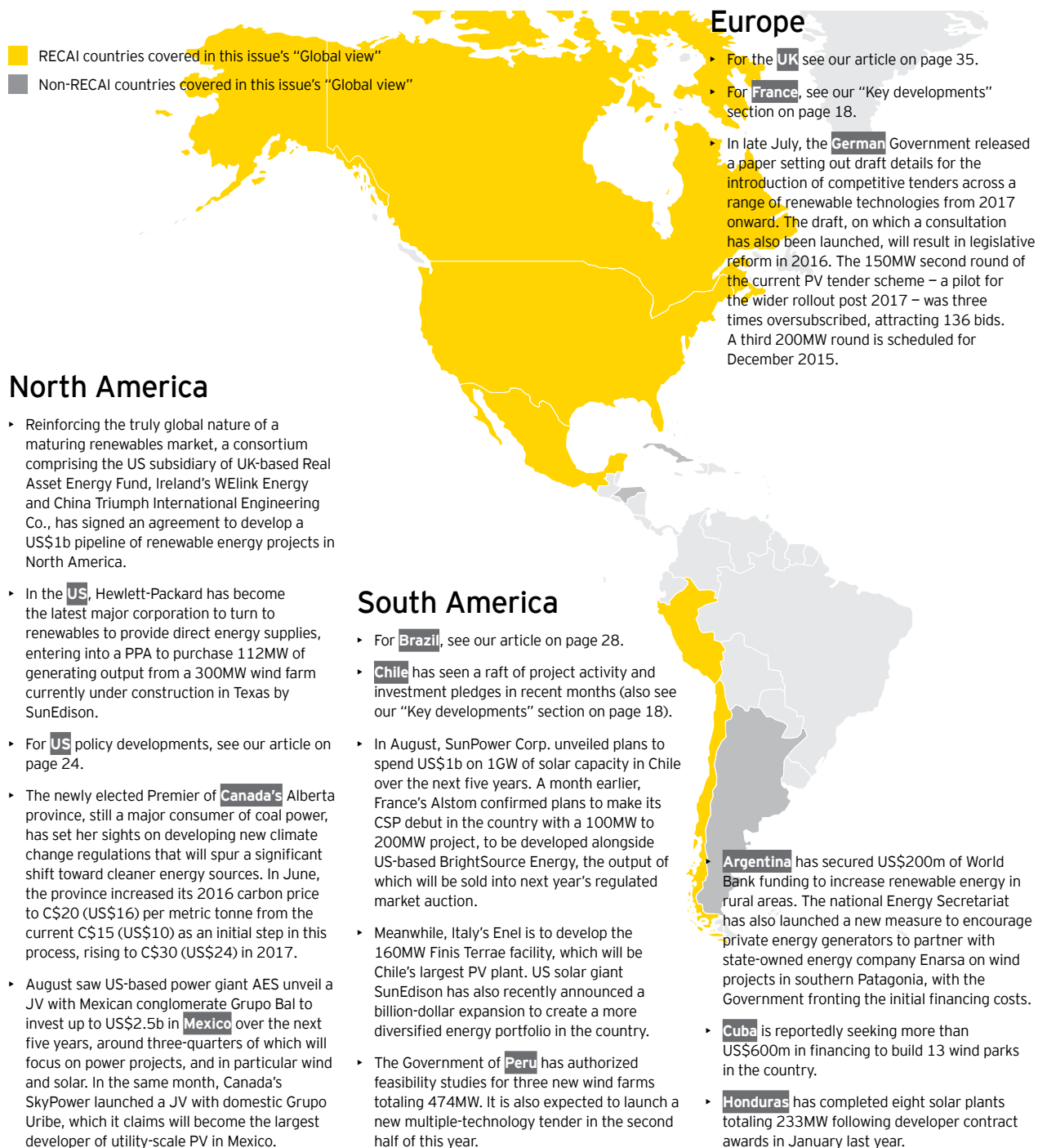
A largely-absent solar market has hindered **Ireland's** position in the index to date; however, plans announced by UK developer Lightsource Renewable Energy to invest "several hundred million euros" to develop PV projects in the country over the next five years has helped it climb to 28th place. The movement also reflects an improving macroeconomic climate, with June seeing an uplift in S&P's credit rating from A to A+, and reports that UK regulator Ofgem is reconsidering its initial March assessment dismissing the 500MW Greenlink subsea interconnector between Ireland and the UK that would primarily facilitate the export of Irish wind power.

Solar ambitions have also helped **Kenya** move up to 31st place this issue, with Canada's SkyPower announcing plans in late July to ink a US\$2.2b deal with the Government to develop 1GW of PV in the country. Also in July, the US-based Overseas Private Investment Corporation (OPIC) committed US\$233m of debt funding to support the 100MW Kipeto wind farm, facilitating yet another major utility-scale project in the country.

Egypt moves up to 35th place as it continues to bolster its renewable energy pipeline, with tenders for a further 200MW of PV, 250MW of wind and 50MW of CSP initiated in August. Separately, the Government has signed a US\$200m deal with Italy's Building Energy SpA to construct two 50MW PV plants.

Global view

Targets are getting more ambitious, projects are getting larger and more capital is flowing, as more and more countries across the globe put the spotlight on their energy needs.



Legend:

- RECAI countries covered in this issue's "Global view"
- Non-RECAI countries covered in this issue's "Global view"

North America

- Reinforcing the truly global nature of a maturing renewables market, a consortium comprising the US subsidiary of UK-based Real Asset Energy Fund, Ireland's WELink Energy and China Triumph International Engineering Co., has signed an agreement to develop a US\$1b pipeline of renewable energy projects in North America.
- In the **US**, Hewlett-Packard has become the latest major corporation to turn to renewables to provide direct energy supplies, entering into a PPA to purchase 112MW of generating output from a 300MW wind farm currently under construction in Texas by SunEdison.
- For **US** policy developments, see our article on page 24.
- The newly elected Premier of **Canada's** Alberta province, still a major consumer of coal power, has set her sights on developing new climate change regulations that will spur a significant shift toward cleaner energy sources. In June, the province increased its 2016 carbon price to C\$20 (US\$16) per metric tonne from the current C\$15 (US\$10) as an initial step in this process, rising to C\$30 (US\$24) in 2017.
- August saw US-based power giant AES unveil a JV with Mexican conglomerate Grupo Bal to invest up to US\$2.5b in **Mexico** over the next five years, around three-quarters of which will focus on power projects, and in particular wind and solar. In the same month, Canada's SkyPower launched a JV with domestic Grupo Uribe, which it claims will become the largest developer of utility-scale PV in Mexico.

Europe

- For the **UK** see our article on page 35.
- For **France**, see our "Key developments" section on page 18.
- In late July, the **German** Government released a paper setting out draft details for the introduction of competitive tenders across a range of renewable technologies from 2017 onward. The draft, on which a consultation has also been launched, will result in legislative reform in 2016. The 150MW second round of the current PV tender scheme – a pilot for the wider rollout post 2017 – was three times oversubscribed, attracting 136 bids. A third 200MW round is scheduled for December 2015.

South America

- For **Brazil**, see our article on page 28.
- Chile** has seen a raft of project activity and investment pledges in recent months (also see our "Key developments" section on page 18).
- In August, SunPower Corp. unveiled plans to spend US\$1b on 1GW of solar capacity in Chile over the next five years. A month earlier, France's Alstom confirmed plans to make its CSP debut in the country with a 100MW to 200MW project, to be developed alongside US-based BrightSource Energy, the output of which will be sold into next year's regulated market auction.
- Meanwhile, Italy's Enel is to develop the 160MW Finis Terrae facility, which will be Chile's largest PV plant. US solar giant SunEdison has also recently announced a billion-dollar expansion to create a more diversified energy portfolio in the country.
- The Government of **Peru** has authorized feasibility studies for three new wind farms totaling 474MW. It is also expected to launch a new multiple-technology tender in the second half of this year.
- Argentina** has secured US\$200m of World Bank funding to increase renewable energy in rural areas. The national Energy Secretariat has also launched a new measure to encourage private energy generators to partner with state-owned energy company Enarsa on wind projects in southern Patagonia, with the Government fronting the initial financing costs.
- Cuba** is reportedly seeking more than US\$600m in financing to build 13 wind parks in the country.
- Honduras** has completed eight solar plants totaling 233MW following developer contract awards in January last year.

Europe (cont'd)

- ▶ In the **Netherlands**, legislation permitting offshore wind competitive tenders awarding around 700MW of capacity annually came into force on 1 July. The inaugural tender of two 350MW projects is scheduled for 1 December 2015 to 31 March 2016. Projects will receive a 15-year subsidy allocation. A landmark Dutch ruling in late June also saw the Government subject to a court ruling to tighten its greenhouse gas emissions rules, the first time any government has ever been legally ordered to do more to address climate change.
- ▶ Plans to develop 1GW of wind power in central **Norway** were put back on the table in late June, just three weeks after being scrapped due to questions over economic viability in the face of low power prices. Intense political scrutiny of the decision has prompted project lead and state-controlled utility Statkraft to work with Norwegian network operator Statnett, to revisit the assessment of the area's development potential, with a recommendation due in September.
- ▶ Russian oil billionaire Viktor Vekselberg has pledged to spend around US\$450m through to 2018 to develop solar farms in **Russia** via Hevel Solar, a JV between Vekselberg's Renova and OAO Rusnano. Hevel, which opened a solar panel factory earlier this year to serve its own projects, is in talks with the Government to secure protection for renewables projects from extreme currency fluctuations. Russia has delayed the next round of auctions to November as discussions continue.

Middle East and Africa

- ▶ **Morocco** has pledged to cut emissions up to 13% by 2030 compared to business-as-usual projections, looking to slash oil and gas subsidies as well as deploy more renewables. However, the Government has also set itself a stretch target of 32% by 2030, though conditional upon international financing support to help raise the estimated US\$45b of investment required to achieve this.
- ▶ Mid-July saw Spain's Abengoa and Israeli infrastructure group Shikun & Binui Renewable Energy reach financial close on the US\$1b required to commence construction of the 110MW Ashalim parabolic trough CSP plant in **Israel's** Negev Desert.
- ▶ Kenya Electricity Generating Company (KenGen) is planning a 400MW wind farm near the Meru-Isiolo border in **Kenya**, with the first 50MW to 100MW phase to be financed via concessional financing. France and Germany's development banks, AfD and KfW, are reportedly already conducting due diligence on the project. Following the completion of a 280MW section of the Olkaria geothermal plant, KenGen is also aiming to construct 700MW of additional geothermal capacity within three years.
- ▶ **Pakistan** has completed the first 100MW phase of the 1GW Qaid-e-Azam Solar Park being developed with Chinese support, the country's first solar project. Pakistan also plans to shortly commission nine wind projects worth around US\$1b and totaling 479MW of capacity, that have been signed under various government deals over the last two years.

Asia-Pacific

- ▶ For **India** see our article on page 32.
- ▶ It is reported that **China** will likely raise its 2020 solar target to 150GW (from 100GW) and wind target up to 250GW to 280GW (from 200GW) to fill a supply gap forecast by expectations that it will miss its nuclear and hydro targets. It has also given its eight major state-owned coal power providers revised capacity upgrade targets to meet their 2015 emissions reduction and energy efficiency targets.
- ▶ The media-leaked conclusions of an eight-month government-commissioned investigation into **Australia's** wind sector recommend cutting support under the federal renewable energy certificate scheme from 20 to 5 years and restrict support to wind projects in states that adhere to rules on low-frequency noise. Meanwhile, SunEdison plans to shake up the rooftop solar market by offering to install panels on homes for free and then sell power back to users at either a metered or fixed rate.
- ▶ August saw **Japan** restart its first nuclear plant since the 2011 Fukushima disaster, beginning a government-backed process to reintroduce nuclear under new safety rules. The Government's latest energy plan, released in July, confirms targets of as much as 22% nuclear power by 2030 and 24% from renewable sources.
- ▶ The **Philippines'** Department of Energy has announced it will likely allocate FITs via auctions rather than quotas once the current FIT allocation periods are over (e.g., 400MW wind and 500MW solar by March 2016).
- ▶ Dutch consultancy Wind Minds and Korea-based DoArm Engineering plan to jointly build two 100MW wind farms at near-shore sites off Jeju Island in **South Korea**.
- ▶ **Taiwan** is raising its 2030 renewables installation target to 17.25GW in order to cope with a declining electricity reserve margin.



US



Highlights

- ▶ The official launch of President Obama's Clean Power Plan formalizes the country's goal to reduce power plant emissions 32% by 2030, requiring around 28% of generating capacity from renewable resources.
- ▶ States have been issued individual targets, and now have until 2018 to submit detailed plans on how these will be achieved, with mandatory compliance from 2022.
- ▶ The production tax credit for wind projects was approved by the Senate Finance Committee but remains in limbo.
- ▶ Distributed generation projects can now access US\$10b in DOE loan guarantees, as well as an additional US\$1b for projects pioneering innovative technology.

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Great expectations. After a year of consultations and more than 4 million public comments, President Obama officially released his long-awaited Clean Power Plan (CPP) in early August, representing the country's first-ever national standard to limit carbon emissions. Yet many in the opposing Republican Party are less than thrilled with the President's "go it alone" approach, leveraging executive orders during his second term to push through such major energy policies. Unsurprising then, that the eyes of the energy world are now firmly on the US, and whether the CPP legislation can survive political gridlock where so many others have failed.

Aiming high. The centerpiece of the CPP is a requirement for power plants to reduce CO₂ emissions nationwide 32% by 2030 from 2005 levels, building on existing interim 2020 and 2025 targets of 17% and 26% to 28% respectively. The 2025 target in particular, reflects a landmark agreement with China last year and the US pledge ahead of this December's UN climate talks in Paris.

The CPP calculates that achieving this emissions reduction target will require renewables to account for around 28% of generating capacity by 2030, double the current figure. Based on a joint commitment made in late July with Brazilian President Dilma Rousseff, 20% of this will come from non-hydro renewables specifically, requiring the US to triple its non-hydro renewable output over the next 15 years. The US currently has 100GW of such capacity in place, comprising around 66GW wind and 18GW solar. The White House also estimates the successful rollout of the CPP will save US energy consumers US\$155b between 2020 and 2030, as well as create various employment, health and environmental benefits.

Setting the timetable. While the destination of the CPP is very clear, the route is much more flexible. Each state will be allocated a specific CO₂ reduction target and requested to submit a detailed plan to the EPA by September 2016 on how this will be achieved. However, states that require additional time can make an initial submission and request an extension of up to two years to submit the final plan.

States have until 2022 to begin mandatory compliance with their respective plans, followed by a "glide path" of reductions through to full compliance by 2030. The CPP provides guidance on phased reduction across the eight-year period, although states can elect their own interim milestones provided these are formalized in the plan. The CPP has also established a "reliability safety valve," enabling states to request compliance deadline extensions if there is a risk implementation will result in significant power supply disruptions.

Rankings snapshot	Issue 45	Issue 44
Total RECAI	1	2
Onshore wind	2	2
Offshore wind	8	8
Solar PV	1	2
Solar CSP	1	1
Biomass	2	2
Geothermal	2	1
Hydro	3	3
Marine	8	9

States have a significant degree of flexibility to tailor their method of compliance.

Flexible working. One of the most important aspects of the CPP, arguably also a defense against its critics, is that it gives states a significant degree of flexibility to tailor their method of compliance, although the CPP does highlight three “building blocks” as a potential framework for state-level plans: (i) improving the efficiency of existing coal-fired power plants, (ii) shifting from higher-emitting coal to lower-emitting natural gas plants, and (iii) increasing the proportion of electricity from renewable resources.

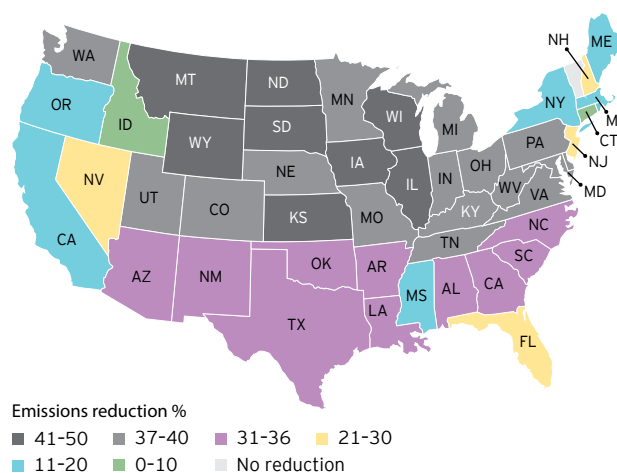
The CPP also promotes regional collaboration on projects and carbon-trading schemes. In particular, the final CPP has converted state-specific rate-based goals to a mass-based equivalent (tons of CO₂ emitted), to make it easier to incorporate mass-based trading of carbon pollution credits into their plans.

Rewarding early action. A key part of the CPP is also the Clean Energy Incentive Program, encouraging states to bring forward investment in renewables and energy efficiency by making additional “emission rate credits” available to those projects deployed in 2020 and 2021, before the official compliance period begins. As a particular priority, energy efficiency projects in low-income communities will receive double credits.

Waiting for the fine print. One of the obvious challenges for this program, and the CPP more generally, is that many of the more specific details on the rules, provisions and mechanics are still outstanding, including the enforcement strategy. The timely release of further details will therefore be critical to enabling state-level policymakers, power producers (both incumbent and potential entrants) and project developers to assess the impact of the CPP on near- and long-term investment decisions. The southeastern states, in particular, may find compliance more onerous given their heavy reliance on coal and the potential economic overhaul that could be required. Although, this could also prompt an influx of project developers eager to step in and gain early competitive advantage in the deployment of cleaner energy solutions.

On the stand. However, the CPP is still expected to face intense legal challenge over the coming months. Sixteen states have already requested a legal stay to put the implementation of the CPP on hold (since compliance deadlines are now technically in place),

US CPP state emission reduction targets 2012-2030 (% reduction in CO₂lbs/MWh)



Source: EPA CPP state target goal data, August 2015.

pending resolution of planned upcoming legal challenges against the EPA that will seek to block the final rules.

Such challenges could include the claim that the Clean Air Act cannot be used to regulate climate emissions, though legal experts have generally agreed the CPP is likely to survive a “pre-emption” argument. Alternatively, a “beyond the fence” challenge could argue that the CPP makes the EPA too involved in policy rather than regulation, usurping state authority over intrastate energy policy and exceeding the agency’s authority.

In a tangle. While this argument could gain more traction, various legal experts have already pointed to the fact the Supreme Court has already given the EPA authority to mitigate carbon pollution. Further, many of these same states had joined early lawsuits to block the EPA rules before they were finalized, but all were subsequently dismissed in court. However, even if the majority of legal challenges are unsuccessful, it could still tie up the CPP in prolonged litigation, with the added pressure of decisions potentially being made after a new president is in office.

Party politics. The success of the CPP will therefore also inevitably depend on President Obama’s successor in the November 2016 election. Democratic frontrunner Hillary Clinton has already voiced her support for the CPP, even announcing a more ambitious target of 33% electricity from renewables by 2027, shortening the timeframe and raising the bar on the CPP targets. Clinton has vowed to expand US-installed solar seven-fold to 140GW by 2020 alone, and revamp federal tax incentives that are “too heavily weighted toward fossil fuels.” While such ambitions will inevitably be criticized by some as big on scale, small on detail, they do at least signal Democrat intentions.



The Republican camp, meanwhile is divided on whether climate change is even a problem at all, making it little surprise that many are dismissing the CPP as burdensome and costly. There is therefore a real risk that a Republican win next year could prompt attempts to dismantle the legislation, or at least significantly water it down.

Safe harbor. At the same time, however, with the CPP rhetoric focusing on broader socioeconomic benefits such as jobs and health as much as on the environmental ones, it could boost already strong public support for a low-carbon economy. Further, pressure from the international community and in particular, the potentially significant outcomes of December's UN COP21 climate change talks in Paris, could make it very difficult for Obama's predecessor to significantly row back on this landmark legislation.

Mind the gap. There is, however, one aspect of the CPP that even the staunchest advocates have highlighted as potentially problematic – the timing. While the plan is applauded for providing critical visibility on a long-term marketplace for renewables, it does risk leaving a short-term gap toward the end of this decade, before key parts of the CPP kick in. With state compliance not technically required until 2022, seven years can be an eternity for developers trying to make long-term investment decisions, and even the renewables-focused Clean Energy Incentive Program does not begin until 2020.

A taxing problem. This question mark over what will drive deployment in the interim is largely driven by the expiry and uncertain renewal of the production tax credit (PTC) for wind power and the post-2016 reduction in the investment tax credit (ITC) for solar. While various power offtake incentives exist at a state level, these federal tax credits are still widely hailed as having been the driving force for renewables deployment, evidenced not least by the boom-bust cycles that have accompanied the nine separate expiries and renewals of the PTC to date.

The timelines set out for the CPP therefore do little to appease the near-term concerns of many wind and solar companies, putting even greater pressure on the call for the extension of tax credits or other policy measures, such as the expansion of tax-efficient Master Limited Partnerships to include renewables.

The 11th hour. Positively, July did see the Senate Finance Committee vote 23-3 to renew the PTC for wind projects through 2016 as part of a broader US\$96b package of tax extenders. However, the bill did not reach Congress before the August recess, prolonging uncertainty for the sector and risking another 11th hour decision – last December's vote to retrospectively apply the expired PTC through 2014 gave developers just three weeks to commence construction to be eligible. While it has provided the industry with another year or two of momentum, the uncertainty around renewal

is arguably more damaging than the expiry itself in creating the boom-bust cycles.

Lost in the mix. The outcome for the PTC for wind therefore remains uncertain, partly due to a Republican congressional majority (although the incentive has historically seen cross-party support), but also because its fate is tied to partisan views on other tax measures within the package. Further, many supporters are calling for a longer-term three- to five-year renewal, even if it involves a phased reduction (which most would be happy with, believing a permanent extension per President Obama's annual fiscal budget proposals to be unnecessary given falling technology costs). However, it is unlikely this will happen before the 2016 election, leaving the wind industry hoping for another one year renewal that will likely only happen in late 2015, if at all.

Offshore credit. Clearer policy support has also become particularly important to galvanize the development of less mature technologies that could contribute significantly to CPP targets in some states, given the potential for utility-scale deployment. Failure to renew expired wind tax credits will likely all but paralyze the offshore wind sector, for example. A bipartisan bill introduced to the Senate in July this year therefore calls for a dedicated 30% ITC redeemable for the first 3GW of offshore wind facilities placed into service in the country.

Solar rush. The solar sector arguably has more visibility over its fate, with the ITC for commercially owned PV systems scheduled to reduce from 30% to 10% from 1 January 2017. However, this is already prompting a rush to complete projects by the end of 2016, since the ITC does not benefit from the "commence construction" eligibility criteria of the wind PTC, something the solar industry is fighting to change. It is also seeking a multiyear wind down in line with system costs (which are even more applicable for this capital cost-based credit), rather than the more dramatic one-off reduction.

A billion dollar guarantee. Given experiences with the PTC, however, the sector is now just steeling itself for the 10% reduction, though utility-scale solar is likely to be harder hit than the rooftop market, with the latter competing more closely with higher (and rising) retail electricity rates. Smaller-scale projects will also get a boost from President Obama's August announcement that distributed energy projects, including rooftop solar, storage and smart grids, can now access US\$10b in existing loan guarantees being solicited by the DOE. Separately, the Government is also making US\$1b in additional DOE loan guarantees available to distributed energy projects utilizing innovative technology.

Silver linings. However, an end to federal tax credits may have some benefits. The loss or reduction in government support is likely to encourage consolidation and shake out some of the weaker



players, while others argue that overreliance on a relatively limited pool of tax equity investors is inefficient and costly. Removing the PTC and ITC would also remove the policy uncertainty that keeps paralyzing the sector's long-term growth.

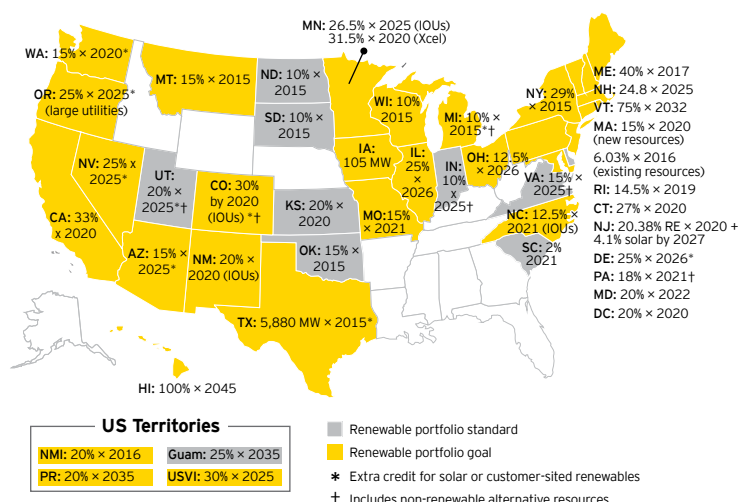
Setting records. Rapidly falling system costs will also help cushion the blow amid tax credit uncertainty. US long-term contracted wind prices reached an all-time national low in 2014 of around US\$23.5/MWh according to recent DOE analysis, below the bottom of the range for national wholesale power prices. Meanwhile, July saw NV Energy sign a 20-year PPA with First Solar for its 100MW Playa Solar 2 project, at a fixed rate of US\$38.7/MWh, a new record for US solar but also potentially one of the lowest electricity rates in the country. Similarly, Austin Energy received bid prices below US\$40/MWh for around 16% of the 8GW of bids submitted in its 600MW solar tender in Texas.

However, not all developers will be able to navigate the uncertainty of whether future credits will be available, and most analysts are still forecasting a major drop in large-scale installations post 2016, until the CPP is able to galvanize sufficient investment certainty.

Raising the bar. In some states, however, a strong commitment to achieving existing or expanded renewable portfolio standards (RPSs) could maintain deployment activity through the anticipated pre-2020 dearth. California, the country's most populous state, is considering amending its RPS to 50% by 2050, from the current 33% by 2020 (which it has almost met). Meanwhile, June saw Hawaii become the first US state to target 100% renewables.

In July, New York announced plans to more than double its renewable electricity generation to 50% by 2030, replacing the current RPS that's due to expire this year, though not legally binding. The state's ambitions as a clean energy trailblazer have also seen it set new rules to allow community net metering and develop an energy road map that includes relatively ambitious plans to boost offshore in the region.

RPS blues. However, recent months have also seen a number of states seek to repeal or weaken their RPS, frequently based on claims that such quotas increase the cost of energy for taxpayers, though evidence is often lacking. Amendments or repeals in some states, such as Kansas and Texas, are also softened by the fact targets



Source: Database of State Incentives for Renewables & Efficiency

have already been met. A number of proposed rollbacks have also been voted down in court this year. In Colorado, for example, claims that the RPS harmed interstate commerce (with Colorado a net electricity importer) were thrown out by the state's appeal court in July.

Last year still saw Ohio freeze its RPS and delay its overall target, while in February, West Virginia – a heavy coal state – became the first to repeal its mandate altogether. It is difficult, however, to assess the extent to which the motivation for rolling back RPS commitments is driven by genuine economic impact, versus entrenched fossil-fuel interested and political ideology.

Free spirit. The US energy market is a complex beast for developers and investors to navigate. Effectively 50 separate markets, for every state that is strengthening its renewables ambitions there is another weakening them. For every state that has achieved grid parity with conventional energy, there is another still heavily reliant on subsidy support. For every state targeting diversity, there is another economically and socially dependent on specific sources. As such, the US energy market will always offer opportunities in 50 shades of green, and this should be encouraged.

Yet, as the US comes under pressure both domestically and internationally to prioritize affordable and low-carbon energy, the CPP is arguably the most ambitious yet flexible mechanism to date for achieving this at a national scale. And as for the short-term outlook? Well, let's just hope that the spirit of the CPP will begin taking effect sooner than the actual provisions do.



Brazil



Highlights

- ▶ A macroeconomic crisis has put energy in the spotlight as electricity prices soar 20% and currency values plummet by around 50%.
- ▶ The Government has committed to spend US\$53b on new generation and transmission projects over the next three years.
- ▶ Further ahead, a joint agreement with the US will see Brazil generate 20% of electricity from non-hydro renewables by 2030.
- ▶ August's wind and solar auctions were more than 15-times oversubscribed, in part due to the injection of some "tariff realism."
- ▶ A lack of domestic supply chain could hinder solar deployment for projects reliant on development bank funding.

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Big picture woes. To say that Brazil's investment climate is currently challenging would be an understatement. Slipping into its worst recession in 25 years, interest rates are rising, inflation is approaching 10% and the Brazilian real has lost around 50% of its value against the US dollar in 2015 alone. Unsurprising perhaps, that late July saw ratings agency Standard & Poor's revise its outlook for Brazil from stable to negative, on top of an already worrying BBB- rating, the lowest investment-grade level. Exacerbating the situation even further is political uncertainty arising from the corruption scandal surrounding state-owned oil giant Petrobras.

Energy in the crosshairs. The energy sector has already been put in the firing line as contributing to the country's economic woes, with rising electricity costs reported to be the main factor pushing inflation to its highest level since November 2003. This has been largely caused by an increase in the use of expensive diesel and gas-fired back-up power plants, in order to avoid power cuts in the face of a three-year drought that has significantly reduced hydropower output – hydro has historically met more than 70% of the country's energy demand. The result has been surging consumer energy bills, rising 20% this year alone, as well as significantly increasing the country's carbon emissions.

Emerging from the crisis. It seems change is in the air, however. The installation of around 1GW of new wind capacity in 2015 alone, for example, has helped bring Brazil's power system back to some normality, while recent unseasonal rains have replenished some reservoirs. Changing weather patterns also meant the country was able to switch off 21 of its most expensive thermal plants in early August. Consumer power prices are expected to fall through the rest of the year as a result, while reduced spot market prices were felt more immediately, much to the relief of power generators who have to trade in the spot market for eventual shortfalls in the PPAs.

Rankings snapshot	Issue 45	Issue 44
Total RECAI	8	9
Onshore wind	5	6
Offshore wind	25	25
Solar PV	8	10
Solar CSP	8	8
Biomass	3	4
Geothermal	32	32
Hydro	2	2
Marine	24	24

If Brazil fails to meet its targets, it won't be for lack of appetite. November's wind and solar auction has already attracted 39GW of applications.

A US\$53b masterplan. Even more positively, this realization of Brazil's exposure to volatile hydropower has prompted the Government to formulate a series of medium- and long-term energy goals, in order to achieve greater energy security and lower energy prices. In August, for example, the Government announced plans to invest around US\$53b in new generation and transmission infrastructure projects by the end of 2018, all licensed through auction rounds. The US\$33b spending on new generation is expected to increase electricity capacity by 25GW to 31.5GW, of which at least 12GW will be from renewable resources (excluding large hydro). Up to half of this is expected to come from wind power and around 3.5GW from new solar PV.

Long-term gigawatts. Looking further ahead, however, Brazil's latest 10-year energy plan forecasts 24GW and 7GW of wind and solar capacity respectively by 2024, compared to just 6GW and 45MW at the end of 2014. The latest update projects annual power consumption growth of around 3%. Late July also saw President Dilma Rousseff enter into a landmark agreement with US President Barack Obama to source 20% of Brazil's electricity from non-hydro by 2030, up from around 10% today (of which 4% is wind and the rest biomass).

Auction appetite. And if Brazil fails to meet these targets, it won't be for lack of appetite. Even with the currently challenging economic and political climate, investors and developers are continuing to clamor for power offtake contracts under the country's national energy auctions. A technology-neutral renewable energy auction on 21 August, for example, received almost 10GW worth of submissions for the 670MW of capacity actually awarded, of which around 80% was allocated to wind projects. Meanwhile, the country's second federal solar-only auction on 28 August attracted 12.5GW of bids, of which 834MW were awarded contracts.

Breaking all records, the 13 November wind and solar auction has already attracted 1,379 of applications totaling 39GW, comprising 18GW of wind capacity and 21GW of solar PV projects. As a reserve auction, it has not yet been revealed how much capacity the Government will actually contract. Applications are also now being requested for a January 2016 A-5 auction, also anticipated to draw significant interest given the five-year window to complete projects compared to the three years for August's auctions.

Tariff intervention. The high degree of interest this year is also likely to have been spurred by the Government's decision to raise the price caps in these latest auctions to compensate for higher costs and risks, in particular the recent dramatic currency devaluation. It injects what the Minister of Mines and Energy Eduardo Braga has referred to as "tariff realism." This is arguably a major shift from the Government's previous policy of keeping prices as low as possible for end users.

The 2.7% price cap increase to BRL184/MWh (US\$51) for wind projects in the 21 August auction disappointed some investors who expected a ceiling price of BRL200+ (US\$56) to compensate for inflation and higher costs. With the actual average price of wind power in the 21 August auction coming in at BRL181/MWh (US\$50), only slightly below this new ceiling price, it is clear that costs have increased and higher rates may be required.

Meanwhile, the BRL349/MWh (US\$97) ceiling price for solar projects was more welcome, representing a 33% increase on the maximum price set for October 2014's first solar-only auction, and well above the BRL300 (US\$84) expected by the market to compensate for the local currency devaluation. Positively, actual average prices in the 28 August solar auction came in at BRL302/ MWh (US\$87), around 13% below this ceiling price, although it is again clear that costs have risen.

Giving solar a break. Recent months have seen the Government being particularly proactive in trying to galvanize the country's burgeoning solar sector. In July, for example, Congress approved a series of tax exemptions relating to some of the raw materials and electronics used to manufacture PV panels, though companies must agree to invest up to 5% of revenues on R&D to be eligible. However, the Brazilian Solar Power Association, Absolar, estimates the exemptions will still make panels 40% to 60% cheaper.

Going local. The Government also proposed various revisions to the distributed generation net metering scheme earlier this year. They aim to reduce bureaucratic hurdles (e.g., enabling shared buildings to benefit without requiring separate systems per individual) and expand eligibility criteria (e.g., systems up to 5MW, from 1MW currently). Meanwhile, a specific rooftop PV program is expected to be unveiled in September and the culmination of such measures is forecast to be at least 2.7GW of rooftop solar by 2024 (from just 7MW currently), in addition to 7GW of utility-scale solar.



Blue water thinking. It seems the Government also isn't afraid to think outside the box, with Minister Braga already championing the deployment of floating solar panels on the country's 674 hydro reservoirs. It's estimated more than 9GW of solar energy could be produced from panels on just 1% of the reservoirs in the southeast region of the country alone. Companies and universities are already bidding for the rights to develop two 5MW pilot projects under an initiative launched earlier this year. Such projects would have the added benefits of reducing water evaporation (and thereby helping to maintain reservoir levels), and utilizing existing hydropower substations and transmission lines.

Hybrid efficiencies. The efficient use of grid infrastructure is also prompting the Government to call for more hybrid wind and solar projects, whereby utility scale solar installations are sited close to existing wind farms. Enel Green Power, for example, has recently connected an 11MW PV plant to the grid using the same power lines and substations as the adjacent 80MW Fontes dos Ventos wind farm in the state of Pernambuco.

Transmission traction. Even with efficient siting, Brazil's transmission network still requires significant investment to avoid bottlenecks connecting the wind-rich northeast with major industrial demand centers in the southeast. The Government intends to hold at least two auctions this year that would more than double transmission capacity between the regions, boosting inter-regional transmission capacity by 11GW by 2020.

Grid connection concerns have also prompted developers to take matters into their own hands. A private partnership across six northeastern wind projects has constructed Brazil's largest wind energy electricity substation. The 1.2GW SE Curral Novo do Piauí II facility, which came online in late August, will receive electricity generated at the various sites, raise the voltage and feed it into the national grid.

Supply chain conundrum. Beyond transmission concerns, the anticipated rapid growth of solar deployment in Brazil has also put the spotlight on its domestic supply chain, or lack thereof. The Government hopes that the tax exemptions will help make domestically produced panels more competitive, as well as reducing currency risk for developers. However, there are currently still no module assembly plants in the country, creating major concerns for the short-term build of capacity, given the domestic content requirements attached to competitive funding from the country's development bank BNDES.

Learning lessons. The solar local-content rules announced by BNDES last year and confirmed in August, seek to replicate the success of the provisions that have long been attached to funding for wind projects in helping to develop a highly competitive domestic supply chain. However, the rules for solar also reflect lessons learned from wind. Manufacturers have five years to gradually reach the 60% to 70% local content requirement (i.e., through to 2020), compared to three years for wind. There will also be more freedom to import components, with BNDES operating on the basis that the more components bought locally – and in particular those it categorizes as “prize” components – the greater proportion of the project it will finance. This means developers could secure funding for up to 65% of the project cost from BNDES, with potential for an additional 15% from the Climate Fund.

Easy access. There are also claims that it will be easier and quicker to develop a solar supply chain (compared to wind), given many components are more readily available (such as aluminum frames and cables). A 2011 study by Abinee, the Brazilian Electrical and Electronics Industry Association, showed that of the 14 large groups of components, 12 were already being made in Brazil. The country also reportedly has the fourth-largest reserve of silicon in the world, albeit currently with no facilities to refine it to PV-grade quality.

Short-term solar woes. However, it is also estimated that production costs in Brazil, especially for steel and glass, tend to be 20% to 30% more expensive than in much of the Western world, let alone China. Further, on the basis that the 1.7GW of PV projects already tendered to date will be looking to BNDES for concession financing, the lack of module assembly plants in the country is already cause for concern given these projects will need to be online as early as 2017.

While BNDES has indicated that more than 20 local and foreign PV module manufacturers have shown interest in entering the market, only two have so far announced firm plans to build module assembly plants in the country – Chinese car maker BYD is planning a 400MW facility, while local firm Pure Energy is targeting a smaller 40MW factory. US solar giant SunEdison has also floated plans to develop a facility, though no official details have been released. Therefore, while there is arguably significant potential for a robust domestic solar supply chain in the long term, the short-term picture is potentially one of bottlenecks and delays as projects struggle to meet the BNDES local content requirements.



BNDES in choppy waters. Even BNDES – the world’s leading arranger of asset finance loans for clean energy in 2014 according to BNEF – is having to navigate the country’s challenging macroeconomic environment. The bank has increased its basic interest rate and reduced loan ceilings from 80% to 70% of total investment for wind projects, although more recent approvals have averaged below 50%. It is also encouraging greater use of private financing, such as local currency debt issued by wind companies, although this remains limited to date, exacerbated by the current macro climate.

Private finance push. It is hoped that the increased ceiling prices for the 2015 auctions will help to alleviate some investor fears about low power prices failing to reflect the higher costs of commercial financing. However, in recognizing the current funding constraints across the energy sector, the federal Government has also launched the Northeast Energy Fund to galvanize an estimated R\$13b (US\$4.2b) of public and private investment in up to 5.4GW of new generation projects through to 2037, half of which will be in the wind-rich northeastern states.

Wind at the top. However, with BNDES interest rates still below 10% (around half the cost of financing offered by private Brazilian banks), it is likely to remain the main financing source for renewable energy projects in the near term. BNDES has already announced that priority will be given to wind energy infrastructure projects – despite having to reduce its total funding, it has pledged to increase wind project funding by 15% in 2015.

No consolidation just yet. This prioritization arguably reflects the ongoing attractiveness of Brazil’s wind sector. Despite now being a highly competitive market, new players are still being enticed to seek entry and the long-expected consolidation of the Brazilian wind market may therefore still be some way off yet.

Earlier this year, for example, France’s EDF Énergies Nouvelle announced the majority acquisition of Sowitec’s 800MW Brazilian wind portfolio, while Canada’s Brookfield and Norway’s StatKraft also recently concluded acquisitions of Brazilian wind power assets. SunEdison’s spending spree has also spread to Brazil, sparking a US\$5b deal to take a 16% stake in domestic renewables firm Renova Energia and absorb 2.5GW of operational and under-construction wind assets into its TerraForm Global yieldco.

Performing better. Further, there is arguably also still scope for improvements in the sector. Despite high capacity factors, lower-than-expected performance is still reported across many projects, prompting a need to review forecasting assumptions and/or evaluate how projects are being operated. Many larger companies are now hiring their own O&M teams rather than just relying on maintenance contracts with turbine suppliers.

Tailored turbines. With many commercial turbines installed in the country also having been designed for European, American or Chinese markets and simply adapted locally, there is also a case for more tailored domestic turbines to drive additional long-term efficiencies in cost and performance; it is estimated stronger, constant, hotter and more humid winds in Brazil force turbines to make almost twice as many revolutions each year as their counterparts in Europe.

Some companies, such as Brazilian industrial giant WEG, are already working on turbines designed specifically for Brazilian conditions. WEG’s prototypes also incorporate smaller and lighter components, seeking to overcome other specific market challenges such as poor road infrastructure, transport restrictions on wide loads (e.g., items wider than five meters require a police escort) and a scarcity of suitable heavy lifting equipment.

Playing the long game. Brazil’s current challenging macroeconomic and political climate is cause for pause, and caution, particularly given the potentially significant impact of a currency devaluation on the cost of imported components and project bankability. Further, notwithstanding the rapid growth of renewables deployment, Brazil is still likely to rely heavily on hydropower and thermal generation for 80% of its supply in the short to medium term.

However, the country also boasts the right ingredients for a renewables market offering long-term investment and deployment opportunities, already delivering some of the cheapest wind power in the world. What is now required are measures to make this growth sustainable, ensure projects remain bankable and accelerate the creation of a domestic solar value chain that will truly open up this potentially lucrative sector. However, with August’s auctions alone 15 times oversubscribed, and the Government putting the words “billion” and “gigawatt” next to Brazilian energy like never before, what is clear is that neither market appetite nor government support are in short supply in Brazil.



India



Highlights

- ▶ The Indian Cabinet has formally approved a target of 100GW solar capacity by 2022, and interim national and state-level annual targets have been set.
- ▶ Major domestic and international investors and project developers are continuing to pledge billions to develop multiple gigawatts of capacity in the country.
- ▶ The Government plans to award US dollar-linked solar contracts to help drive down prices via lower borrowing costs, while some solar projects are already reaching grid parity.
- ▶ Key challenges such as land acquisition, uncertain local support and the financial weakness of distribution companies will need to be addressed to come close to meeting the country's ambitious renewables targets.

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Making it official. While India's ambitious and much-debated 100GW solar target has barely been out of the headlines over the past eight months, June did at least see it move from fiction to fact, with the Indian Cabinet officially approving the goal of 40GW rooftop solar and 60GW utility-scale solar by 2022.

Setting expectations. Building on this in August, the Ministry of New and Renewable Energy released a roadmap setting out a year-by-year breakdown to achieve these targets. The plan envisages an additional 2GW of solar capacity in the financial year 2015-16, 12GW in 2016-17, increasing gradually through to an additional 17.5GW in both 2020-21 and 2021-22. The Government has also published tentative yearly breakdowns of individual state-level targets for the 40GW of rooftop solar, given such projects are expected to be commissioned mostly by state governments through their own solar power policies.

Legislating simplicity. In a further attempt to formalize its ambitious renewable energy policies, the Government released a draft National Renewable Energy Act 2015 that aims to bring various elements of piecemeal energy legislation under a single umbrella, to ensure complementary actions and avoid duplications. The draft was open to public consultation throughout July. Early September also saw the Government finally approve the National Offshore Wind Energy Policy.

Going international. There has already been much speculation over whether India can meet these targets (plus 60GW of wind capacity by 2022). Some are optimistic it is achievable if the Government delivers on the reforms it has promised, though most quantitative forecasts so far still predict a shortfall, albeit ranging from a significant gap to a near miss. However, there is little speculation that foreign investment will be critical to meeting these targets and even less speculation that there is appetite. Estimates suggest that US\$300b in foreign investment is already planned for India's renewable sector over the next 10 years, potentially also benefiting from slower growth now expected in China.

Rankings snapshot	Issue 45	Issue 44
Total RECAI	3	4
Onshore wind	3	5
Offshore wind	16	16
Solar PV	3	4
Solar CSP	5	5
Biomass	15	15
Geothermal	14	14
Hydro	9	6
Marine	11	11

Government will award dollar-linked solar power contracts to make cheaper dollar-based financing easier to access.

A 20:20 vision. In what is tipped to be one of the largest investments in India by a foreign company, Japanese telecoms giant SoftBank has joined forces with Taiwan-based manufacturing powerhouse Foxconn and Indian conglomerate Bharti Enterprises to invest around US\$20b in more than 20GW of solar projects across the country. The JV, SBG Cleantech, will initially construct solar parks, including bidding into government-led auctions, but may also expand to cover solar panel manufacturing.

Recent months have also seen US solar giant SunEdison commit to invest US\$15b by 2022 to develop around 15GW of capacity, having already established a foothold via its June acquisition of Indian developer Continuum Wind Energy. Meanwhile, Sarus Solar, a JV comprising three Canadian firms, is planning a series of 500MW solar parks in the country, and China's Trina Solar is to invest US\$500m in a solar panel manufacturing facility with India's Welspun Energy.

Staying at home. It's not only foreign companies that are aiming high, however. India's Adani Power plans to develop a 10GW PV complex via a 50:50 JV with Rajasthan state, requiring around US\$9.3b of investment and likely to be India's largest solar park. It will reportedly also house manufacturing facilities set up under the "Make in India" campaign. Rajasthan state could also see 6GW developed by India's Reliance Power over the next decade, while Suzlon has also been vocal about refocusing its attention on the Indian market after a period of outbound investment.

Reaching parity. Only time will tell the extent to which such bold project and investment commitments crystalize. However, one of the key factors boosting optimism around India's renewable ambitions is that grid parity is in sight for an increasing number of projects. This is particularly the case for solar, with tariffs having dropped 60% over the past four years to an average of around INR5,750/MWh (US\$87), rivaling the price of many conventional power sources.

In July, Canadian solar developer SkyPower broke records by securing 150MW of solar projects in the state of Madhya Pradesh at the lowest tariffs ever quoted in India. The cheapest of the three 50MW PPAs awarded was just INR5,051/MWh (US\$79) with no price escalation. Tenders recently held in the states of Telangana and Punjab have returned similarly low prices.

Falling fast. Equipment prices are expected to drop a further 30% to 40% over the next few years due to technology and efficiency improvements, according to Deutsche Bank. A recent government announcement that the exemption of custom and excise duties has been extended to the raw materials used for solar power equipment manufacturing is also expected to accelerate cost reductions.

Dollar power. With an aim of reducing solar tariffs down to around US\$45/MWh, the Government has also committed to award its first US dollar-linked solar power contracts, in order to make cheaper dollar-based financing easier to access for developers. It estimates the move could reduce borrowing costs by around a third.

National Thermal Power Corporation (NTPC), India's largest energy conglomerate, has been tasked with tendering an initial 500MW to 1GW of such dollar-based contracts, although it seems the original July schedule has slipped. These contracts will pay the rupee equivalent of the dollar tariff determined by the bidding process, and NTPC will create a fund to manage the currency risk it takes on. However, the challenge will be whether India can scale up its program of dollar-based pricing while shouldering the currency risk, particularly given the risk of default on fixed rupee tariffs by some utilities.

Going, going, gone. Auction fever is already gripping India's energy market and is likely to remain a key delivery model in the short to medium term. NTPC is facilitating 15GW of solar-specific reverse auctions by 2019 on behalf of the Government, in addition to its own 10GW of solar projects. Meanwhile, Solar Energy Corporation of India invited bids for 3GW of capacity across five states in July, and August saw the submission of tenders for 750MW of capacity under the 2GW second phase of the National Solar Mission. However, with the base tariff set for this auction higher than the average prices revealed in recent state-level tenders, bidders are not expected to require viability gap funding (VGF) – the main basis of evaluation in previous rounds – potentially prompting bidding based on a discount over the base tariff should the VGF ranking criteria become redundant.

Landing hard. The significant volumes of capacity being allocated at both a state and federal level, and the billions of dollars of private sector commitments, should not overshadow the significant challenges that India faces in meeting its ambitious renewables targets. Land acquisition remains one of the major issues for many



projects. Current legislation is highly bureaucratic and contains various restrictive legal provisions that make purchases for industrial activity a costly and time-consuming process. This is largely because land is a highly politicized subject in India, given that the majority of the population subsists on agriculture and farming. Acquisition of much sought after agricultural land for example, requires a statutory social impact assessment that mandates consent from 70% of local farmers for PPPs and 80% where land is acquired privately.

Efforts to amend the Land Acquisition Bill to be more industry-friendly have so far failed, with the Modi Government lacking a majority in the parliamentary upper house, prompting it to pursue diluted consent clauses in the meantime.

Getting creative. However, the Government is also exploring other ways to circumvent the land issue. In Gujarat, for example, it is working in partnership with SunEdison to cover the district's canals with solar panels. While currently only a small 1MW pilot project is installed, the state estimates that a utilization rate of 10% of the existing 19,000km canal network would allow the installation of 2.2GW of PV. Off-grid rooftop or community solar projects are also being incentivized, while states with a relatively high proportion of barren, infertile land are being identified and targeted.

Going large to reduce risk. The Government also believes that its plan to create 25 giant solar parks, each with a minimum capacity of 500MW, will help reduce the number of land acquisition requests and thereby minimize approval delays and risks to bidders. These larger projects will also focus the development of suitable infrastructure and access to amenities at a limited number of specific sites. Further, the solar parks can be sited on government waste land, desert areas and highway roadsides, with sites for at least 19 projects reportedly having already been identified. The Government estimates the cost of acquiring the land for the 25 sites to be around INR40b (US\$638m) – not an insignificant figure but arguably also not insurmountable in the context of the US\$100b solar program.

Winning support. For the raft of other medium- to large-scale projects planned across the country, there is still a need to secure the buy-in of local communities. With more than 750 million Indians living on less than US\$2 per day and conventional power so heavily subsidized, many are still skeptical of alternative energy sources they perceive to be more costly. Entrenched political or business interests have also prompted scaremongering in some rural areas, in order to obstruct renewable energy projects in favor of cheaper conventional electricity from the grid.

Winning the trust and educating rural residents is therefore a key part of project development in India, though achievable in different ways. Some projects in Andhra Pradesh, for example, have included a legally binding provision that landowners will participate in future capital appreciation and income generation. Meanwhile, other companies are contributing to wider community projects, from children's health care to drinking water supplies. Further, India has made it mandatory for corporates to invest 2% of profits in corporate and social responsibility (CSR), including renewable investment for community development.

Systemic challenges. The trade-off of juggling the needs of India's poor versus meeting the country's energy targets also stems from the calamitous financial state of India's power distributors. Having historically been forced to sell electricity below cost to keep energy affordable for end users, the country's utilities and distributors have reportedly accumulated more than INR2.5t (US\$40b) of losses. The risk of delayed or defaulted payments is therefore a concern for some investors.

Diversifying risk. Further, with conventional power still ultimately the cheapest form of energy for distributors to purchase, many simply won't purchase renewable energy beyond the amount required. In Tamil Nadu, for example, around half of the 8GW of installed wind capacity is reportedly curtailed because distributors cannot afford to buy it. Renewable energy developers and investors must therefore look to operate across a number of states in order to diversify distribution risk, as well as its customer base. Developers cannot rely on cash-starved utilities alone, and therefore private companies must also be target offtakers, either as onsite consumers or via offtake PPAs.

Making it happen. Few doubt the genuine commitment of India's Government to transform the country's energy sector, or that the demand for secure and affordable power is immense and growing – the latest UN figures forecast India overtaking China as the most populous country in the world as early as 2022, and not peaking for several decades. With so many systemic challenges impacting the ease of doing business in India, however, there are still many broken parts to fix and this will take time.

Yet if some of the larger and more experienced investors and developers making bold pledges are able to overcome some of these risks, reduce costs, accelerate knowledge transfer to deliver precedent projects that establish proof of concept for bankable renewables projects in India, this could accelerate the growth of one of the most attractive renewable energy markets in the world. Given the size of the prize, the eyes of the world will remain on India for some time yet to see whether it can deliver.



UK



Highlights

- ▶ A wave of policy announcements reducing or removing various forms of support for renewable energy projects has left investors and consumers baffled.
- ▶ Government justifications on the basis of affordability are under scrutiny, with onshore wind and solar touted as being among the cheapest sources of energy in the UK.
- ▶ The removal of climate change levy exemptions could see onshore wind operators lose at least 6% of revenue.
- ▶ The lack of clarity and direction around UK energy policy may undermine investment in other areas, also threatening new nuclear build, CCS and the much-hyped shale-gas revolution.

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A wasted opportunity. We concluded in the previous issue of RECAI that post-election stability provided the new Conservative government with a unique window of opportunity to reconcile its somewhat contradictory energy objectives and address the conflict between its liberalized market rhetoric and policy that is clearly picking winners and losers, regardless of market signals. Based on developments over the past quarter, however, it seems the UK Government has decided to pass on that opportunity.

Feeling the pain. Rather, a plethora of policy-related announcements in the three months to August suggest that the Government has sentenced the UK renewables sector to death by a thousand cuts.

- ▶ Support for onshore wind under the renewables obligation (RO) regime will end on 1 April 2016, a year earlier than planned. Projects in development must be commissioned by this date to be eligible for support, although the Government has proposed a grace period through to April 2017 for projects already with planning consent, a grid connection offer and acceptance, and evidence of land rights.
- ▶ A proposal to close the RO for solar projects under 5MW (including capacity extensions of existing projects) from 1 April 2016, a year earlier than scheduled, and reduce the level of support for projects seeking eligibility up to that date.
- ▶ A proposed end to the “grandfathering” that guarantees the level of RO subsidy across the project life for solar projects less than 5MW.
- ▶ The proposed removal of pre-accreditation that guarantees a certain FIT level ahead of project commissioning for small-scale renewables projects. Instead, developers will only receive a rate at the time they apply for accreditation, meaning the final unit tariff received could fall during the course of project development.

Rankings snapshot	Issue 45	Issue 44
Total RECAI	11	8
Onshore wind	13	11
Offshore wind	1	1
Solar PV	16	13
Solar CSP	27*	27*
Biomass	7	5
Geothermal	20	20
Hydro	25	25
Marine	5	2

Uncertainty over when the cliff edge will occur is likely to increase the cost of developing projects in the meantime.

- Plans to impose an annual spending cap on FITs awarded to new projects through to March 2019, after which the scheme will be closed to new entrants. However, this cutoff could be as early as January 2016 if cost control measures are not implemented or effective in ensuring expenditure is “affordable and sustainable.” The proposal also sets out new reduced tariff levels and a quarterly degression system.
- Energy supplied under renewable source contracts will no longer be exempt from the climate change levy with effect from 1 August 2015. Generators will therefore be unable to sell levy exemption certificates (LECs) for power generated after this date, though LECs will still be valid in respect of power generation up to that date during a transition period.

Watching the pennies. The Government has justified these policy revisions largely on the grounds of affordability, and as part of a wider program of reduced spending. In the national budget presented in early July, Chancellor George Osborne called for savings of up to 40% from individual government ministries, with more details expected in November’s spending review.

However, a projected overspend of the levy control framework budget that sets the spending on renewables-related support and is covered via consumer energy bills, has already been touted by the Government as the trigger for the above measures. It estimates actual spending will reach £9.1b (US\$14.0b) in 2020–21 compared to the budget of £7.6b (US\$11.7b). Critics note, however, that this still falls within the budget’s 20% headroom allocation to allow for unforeseen changes in energy prices or technology costs.

Nonetheless, new Energy and Climate Change Secretary Amber Rudd maintains that the proposals are designed to minimize consumer energy bills, while simultaneously claiming that falling costs mean many renewables projects can survive without subsidies.

Premature. Ironically, few in the renewables sector would disagree with the latter sentiment, with most acknowledging that onshore wind and solar PV will likely be cost-competitive and subsidy-free within the next three to five years. However, in withdrawing support prematurely, the Government arguably risks stalling or killing projects that would otherwise maintain the momentum to get the market to that critical point.

Cryptic messages. Projects not qualifying for the RO will now become reliant on winning support under the new contracts for difference (CfD) scheme based on competitive bidding – in theory at least. Rudd’s somewhat cryptic responses in a parliamentary committee session in July have cast major doubts on whether onshore wind will be included in future CfD rounds, when the next round will be held and even whether there will be further rounds at all. While this has created some nervousness, most are relatively confident there will be further auctions, albeit unlikely this year as scheduled. However, some claim the Government will be effectively rigging auctions and restricting competition if onshore wind is excluded from future CfD rounds.

Further, even though the Government estimates up to 5.2GW of projects could be RO-eligible through the proposed one-year grace period, failure to include this grace provision in the legislation will likely make many debt providers unwilling to lend to projects that would be relying on it, or at least not without revised terms.

No solar solace. No such grace period has been offered for mid-scale solar projects impacted by the earlier-than-scheduled RO termination, and the move somewhat contradicts the Government’s repeated commitments to boost the commercial solar rooftop market. According to the UK Solar Trade Association, support for solar under the RO currently adds just £3 (US\$4.70) per year to each household bill and only makes up 6% of the total RO budget.

Looking over the cliff. Proposed amendments to the FIT regime also make it an unwelcome hat-trick for solar, with 12-months of policy revisions now impacting small-scale installations as well as large- and mid-size projects. The combination of the proposed changes – lower tariffs that cannot be locked-down until commissioning and the underlying threat of the scheme being axed altogether as early as January 2016 – will likely trigger a massive market rush to complete projects before the proposals are approved and then subsequently take effect.

Not only does this cliff edge put a major question mark over any kind of long-term future for the UK’s residential solar market, but uncertainty over when that cliff edge will occur could also increase project development costs in the meantime. No surprise then that many are describing the Government’s proposals as something of an antithesis of sensible policy for achieving better public value for money.



Going retro. The shock announcement that CCL exemptions will be withdrawn with almost immediate effect is also expected to have a distortive impact on the cost and build out of future projects, as well as a detrimental impact on existing projects. The industry had been expecting a phase out of LECs, but not until after 2020. According to RenewableUK, LECs account for just over 6% of onshore wind generators' revenues, meaning the change could result in substantial lost income for some projects. The retrospective nature of the policy revision will also likely spark legal actions. However, some have pointed out that the proposed reduction in UK corporation tax in June's budget will largely offset the removal of the CCL exemption.

Offshore benefit. A potential silver lining for the wind sector as a whole is that the Government apparently intends to redirect the money saved by cutting support for onshore wind to less mature technologies such as offshore wind. The UK is currently the world's largest offshore wind market, with just over half of global installed capacity. Many also still have high hopes that it can lead the way in reducing costs and making the technology more commercially competitive. The potential is certainly there to achieve this.

Knock-on effect. However, while the most recent round of policy revisions won't impact offshore wind directly, there is a risk that the severity, timing and delivery of the proposals impacting other sectors, as well as the lack clarity over the Government's long-term energy strategy, will generate sufficient developer and investor uncertainty to trigger an exodus from the UK market. It has already prompted Forewind to scrap the 2.3GW third phase of its mega-scale Dogger Bank offshore wind complex. Uncertainty over the remaining CfD budget available for offshore wind projects is also cause for concern.

The wrong direction. There are fears, however, that the savings will also be used to spur the deployment of more expensive nuclear and more carbon-intensive shale gas. The Hinkley C nuclear plant has already proved expensive given the significant subsidy requirement; with the EU recently noting that subsidizing nuclear but not onshore wind could break state aid rules. The Government is also continuing to seek ways to galvanize the UK's shale gas sector, despite strong public opposition and the fact that previous tax breaks and easing of planning rules have failed to spur a single fracking well in the last three

years. Yet, in August, the Government announced plans to fast-track shale gas planning applications, step in to take over from local councils that repeatedly fail to reach a planning decision within 16 weeks, and consider appeals on failed applications.

Contradictions. This almost inexplicable drive to catalyze sectors that are publicly unpopular or relatively expensive exposes major inconsistency in its thinking – namely seeking to reduce consumer energy bills and make broader economic savings, while simultaneously instigating policy measures that will slow deployment of some of the cheapest forms of energy in the UK. With onshore wind and solar also boasting the potential for further cost reductions, such discrimination seems hard to comprehend.

Tunnel vision. It also undermines the Government's apparent goal of cutting carbon emissions as cost-effectively as possible. If anything, the latest announcements indicate the Government is preoccupied with just doing enough to meet its 2020 EU emission reduction targets, lacking any real long-term ambitions. And yet even in the short term, government claims that the UK now has enough subsidized projects in the pipeline to meet its EU renewable energy commitments contradicts the latest European Commission progress report, which projects that the UK will fall short of its 2020 RE target.

The bigger picture. And so how to make sense of these apparent inconsistencies? At best it may be a case of misguided short-term politics getting in the way of long-term policy. At worst, however, it's policy-making in a vacuum, lacking any rationale or clear intent. Though the latter is more worrying, both have the power to sour the UK's attractiveness as an investment destination more broadly. After all, if the Government is prepared to pull the rug from under the feet of investors backing low cost and sustainable energy when it is most needed, is any sector really safe from such abrupt policy intervention?

The question is, should the UK renewables sector continue to fight policy tinkering by a Government with unclear motivations, or is this an opportunity for it to throw off the shackles of policy dependency and establish itself at the forefront of unsubsidized renewables in Europe? The latter won't be easy, but it may well be worth taking the risk.



Turkey



Highlights

- ▶ A new Renewable Energy Action Plan targets a minimum 30% of electricity generation from renewable sources by 2023, requiring around 61GW of renewables capacity.
- ▶ A 3GW wind tender in early 2015 attracted more than 42GW of submissions, while a planned future 2GW wind auction has been brought forward to 2016.
- ▶ An additional 3GW of grid capacity will be opened up to large-scale solar projects in addition to the 600MW tendered earlier this year.
- ▶ However, more will need to be done to overcome grid constraints, inefficient permitting process and auction delays that have caused Turkey's renewable sector to grow at such a slow pace.

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Macro fright. June's shock parliamentary election outcome that saw the Justice and Development Party (AKP) fail to secure an overall majority for the first time since 2002, has thrown an already relatively fragile economy into a period of political uncertainty. Like a number of other emerging markets, Turkey is currently experiencing an economic slowdown after a decade of rapid growth, with unemployment at a five-year high and the Turkish lira falling to a record-low against the dollar.

The bright side. For those who have long seen Turkey's potential as a clean energy haven as more mature markets become saturated or distorted, a current account deficit largely caused by the high cost of gas imports, may be a blessing in disguise. Combined with the country's ongoing ambitions for EU membership, these high energy costs and low energy security have prompted the Government to produce an EU-style Renewable Energy Action Plan (REAP) in order to formalize its energy strategy.

Energy by numbers. The REAP released in early 2015 sets out clear targets that provide the market with greater visibility over the minimum capacity that will be supported or procured by government over the next eight years. The plan sets out a minimum target of 30% electricity generation from renewable sources (including hydro) by 2023, supported by technology-specific capacity targets that the Government believes will achieve this. The REAP calls for 34GW of hydro, 20GW of wind, 5GW of solar and 1GW each of biomass and geothermal.

This will require a seven-fold increase in non-hydro capacity over the next eight years, during which time the Government forecasts total capacity will need to almost double to 125GW. Interestingly, however, the generation conversions of these capacities in the REAP equate to around 38% of the projected total electricity generation for 2023 (i.e., 159GWh as a proportion of the projected 424GWh total), compared to the Government's explicit commitment of 30%, or 127GWh per the REAP. This indicates a 32GWh potential buffer to allow for either underbuilding or underperformance.

Rankings snapshot	Issue 45	Issue 44
Total RECAI	15	17
Onshore wind	9	10
Offshore wind	24	24
Solar PV	24	26
Solar CSP	11	14
Biomass	34	34
Geothermal	6	6
Hydro	6	9
Marine	20	20

There is still a long way to go to meet the targets, though there are signs the market has gained momentum this year.

Picking up pace. With current installed wind capacity of around 4GW and solar less than 200MW, it's clear there is still a long way to go to meet these targets, though there are signs the market has gained a little more momentum this year. January and April saw the Turkish grid operator TEIAS conclude two long-awaited tender rounds to award 600MW of large-scale solar contracts, with bids originally submitted in 2013, when the call for tender attracted almost 9GW of applications.

Meanwhile, in May, energy regulator EPDK evaluated pre-license applications to allocate 3GW of wind capacity in a tender that was also significantly oversubscribed, generating submissions totaling almost 42GW. The Government announced in August that it will contract a further 2GW of wind capacity in 2016, bringing forward a program originally to be completed by 2020. EPDK will collect preliminary license applications in the period 3 to 7 October 2016.

Stuck in the past. While a 13- to 15-fold oversubscription in Turkey's latest wind and solar auctions indicates a high degree of appetite to develop projects in the country, some caution is also advised. The country's first wind tender in 2007 attracted a staggering 78GW of applications, but a number of challenges, such as grid limitations, an inefficient auction process, legislative changes and a high degree of bureaucracy, have resulted in significant project delays. Beyond the 4GW of operational capacity, an estimated 6GW of projects have been licensed and are nominally under development, although there is still some skepticism over how much of this capacity will actually be built.

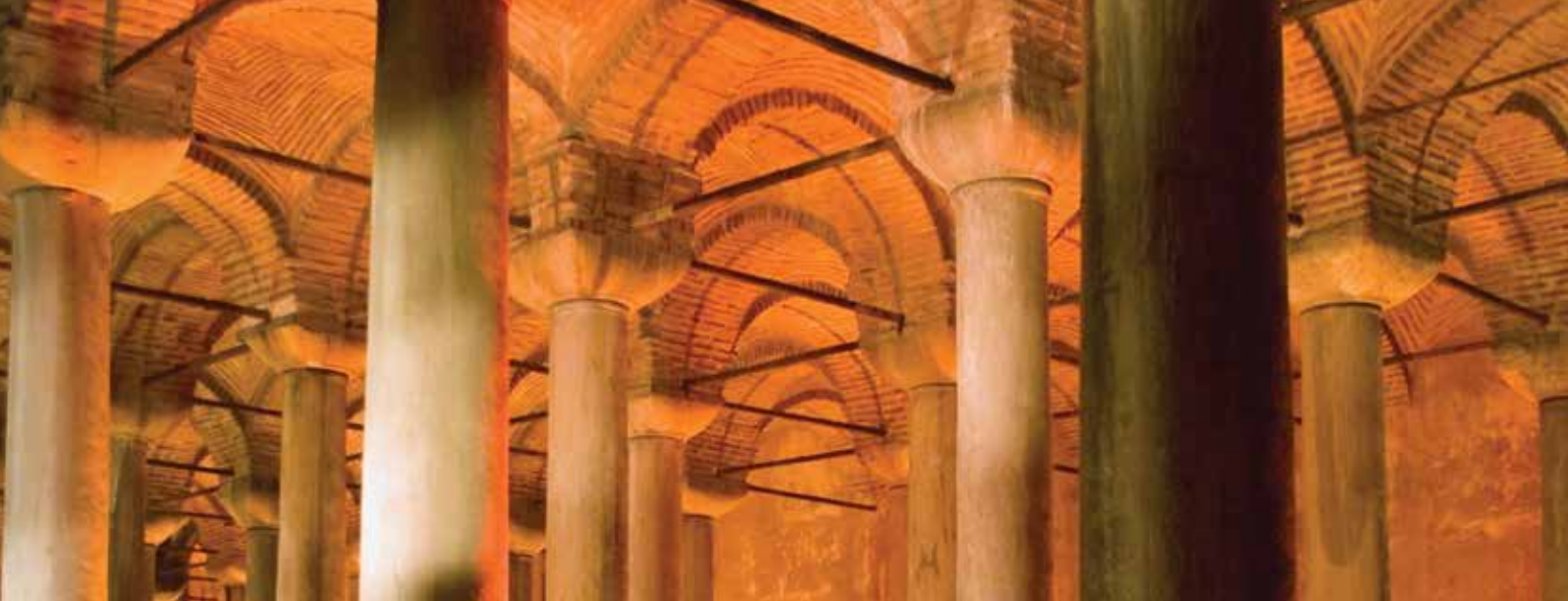
Grid gripes. Grid access remains one of the most fundamental issues for Turkish energy projects. Limited infrastructure means that TEIAS must hold grid access tenders to allocate capacity at regional substations to successful bidders. This is also required to resolve competing applications to develop projects on the same prime sites. In the 2007 wind auction, a process of voluntary negotiation between companies bidding on the same sites saw total capacity drop to 40GW from 78GW. However, TEIAS's subsequent grid access tenders still resulted in significant overbidding, with many developers committing to grid fees that reduced project profitability and in turn jeopardized their ability to secure finance.

Many projects have been delayed or fallen through as a result of this. While EPDK is able to cancel licenses where it can demonstrate a developer lacks the intention or ability to develop a site, the legal appeals process for full licenses can take up to seven years and pre-licenses two to three years, after which the whole process to allocate licenses must still be re-run. Freeing up grid capacity and locations for new developers is still therefore a relatively time-consuming process, although EPDK has initiated some cancellations since mid-2014. It is also recognized that TEIAS is trying to improve its grid and expand the amount of variable access available, though access slots are still limited and there remains a risk of overbidding.

Pre and post assessment. There have also been some revisions to the licensing process itself since the 2007 tender that should help to increase the likelihood of project delivery, albeit still creating a relatively complex and time-consuming process. Following an amendment two years ago, developers are now obliged to first apply for a pre-license, only issued once connection to the system and resource access rights are secured. A full generating license is then issued only once various permits and approvals are obtained. This system also prevents developers from selling on licensed projects.

Slow solar. Notwithstanding, it still sits somewhat uneasily that Turkey has less than 200MW of solar capacity despite its size and abundant solar resource. The Government initially discouraged solar development due to the high FIT levels needed to ensure project viability. The limited capacity of TEIAS's grid to handle variable inputs also resulted in the relatively low 600MW limit for the 2013 solar tender.

Avoiding the pain. Another key factor in the limited deployment of solar capacity at scale is that all projects above 1MW require a license from EPDK that can take several years to obtain. Combined with the relatively limited opportunities to participate in tenders for large-scale projects to date, installations have remained relatively small scale. According to Turkey's International Solar Energy Society (GUNDER), a further 800 small unlicensed plants are currently under construction but could add as much as 2GW of operational capacity over the next two years.



However, with Turkey's power prices increasing as the cost of large-scale solar PV continues to plummet, the Government has been more encouraging over the past year or so. In June, it was announced that TEIAS is preparing to make a further 3GW of grid access available for solar power plants, and there are reports that the licensing threshold could increase from 1 MW to 5MW on the back of the Government REAP targets.

Drilling for success. One area where Turkey can be almost certain of meeting its REAP target ahead of schedule is geothermal. The country has around 405MW of capacity in operations, with just over 1GW of capacity already granted licenses or pre-licenses. It is therefore likely to significantly overshoot its 1GW target for 2023, though perhaps unsurprising given Turkey's estimated 31.5GW of geothermal resource (albeit not all suitable for power generation). In July, the European Bank for Reconstruction and Development (EBRD) organized US\$720m in loans to help Guris Holding develop its 170MW Efeler plant, the largest geothermal power plant in Turkey and one of the ten largest in the world.

Turning the tide. Adding another tick to the technology diversity checklist, recent analysis by consultancy Totaro & Associates estimates that Turkey could have untapped offshore wind resource potential of around 32GW, so far largely ignored given transmission complexities and water depths. However, the group projects that advances in floating turbine technologies and increased investment in onshore transmission infrastructure could open the door for Turkey to be more aggressive with its wind targets by adding offshore capacity into the mix.

Standing firm. While Turkey's current economic and political climate will inevitably cause concern for some developers and investors, it is encouraging that a number of international financial institutions remain bullish and optimistic about the country's energy market in general. The IFC, for example, has confirmed that it will add at least another US\$400m in power, IT and infrastructure equity investments in the current fiscal year, seeing Turkey as an attractive equity destination given the scarcity of third party capital in the country, especially for energy companies that want to expand.

Meanwhile, the EBRD is steadfast in its commitment to provide at least US\$180m to help finance renewable

energy projects valued between €10m (US\$11m) and €40m (US\$45m). The new fund is the latest initiative from the EBRD under its ongoing €1.0b (US\$1.1b) Mid-Size Sustainable Energy Financing Facility, contributing to the €2.2b (US\$2.5b) it has invested in clean energy projects in Turkey since 2009.

Producing results. The most recent auctions, as well as future allocations, should also create sufficient demand to drive opportunities for expansion of the domestic supply chain. An estimated 78% of the projects that have been licensed but not yet built, for example, have yet to select a turbine vendor.

While local content bonuses awarded under Turkey's FIT scheme have so far failed to incentivize significant domestic production, a number of major wind turbine manufacturers such as Vestas, Siemens, GE and Sinovel have indicated they are simply awaiting a more robust order book in Turkey before making firm commitments to increase domestic production. The country is also well-placed as a potential export hub serving Europe's Balkan states and the Middle East, while some Chinese solar panel manufacturers are also seeing factories in Turkey as a way of serving the European market while circumventing the bloc's anti-dumping duties.

Overcoming the paradox. The Turkish renewable energy market is something of an enigma. An increasing dependence on natural gas imports in response to soaring energy consumption, abundant renewable resource and oversubscription of auctions, all point to a highly attractive renewable energy market. And yet, progress to date has occurred at a somewhat glacial pace, and conventional energy still dominates the country's energy pipeline, with an estimated 34GW under development or granted pre-licenses.

This makes it very difficult to determine how ambitious the 2023 REAP targets really are. Simultaneously appearing to be a major challenge given complex and time-consuming permitting processes, tender delays, major grid constraints and a limited track record of private capital, yet also more than achievable based on need and market enthusiasm. If the Government doesn't want renewables to be squeezed out of the energy equation therefore, even more effort will be required to address the barriers that have created this paradox.

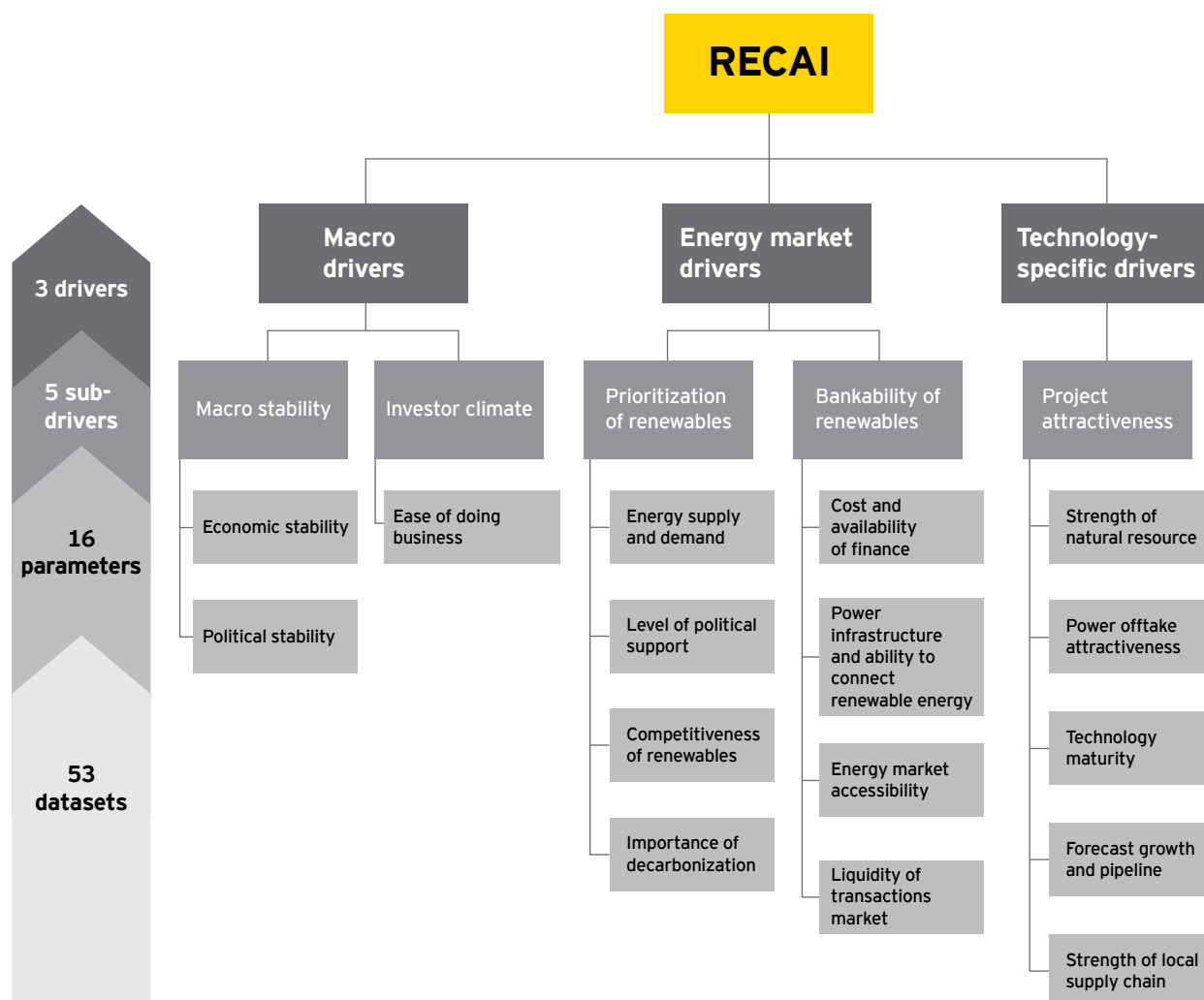
Glossary

Abbreviation	Definition
b	billion
BNEF	Bloomberg New Energy Finance
CfD	Contract for difference
CPP	Clean Power Plan
CSP	Concentrated solar power
DOE	Department of Energy
EBRD	European Bank for Reconstruction and Development
EPC	Engineering, procurement and construction
EU	European Union
FIP	Feed-in premium
FIT	Feed-in tariff
GW	Gigawatt
IFC	International Finance Corporation
IFI	International finance institution
IP	Intellectual property
IPP	Independent power project
ITC	Investment tax credit
JV	Joint venture
kWh	Kilowatt hour
m	million
Masen	Morocco Agency for Solar Energy
MENA	Middle East and North Africa
MW	Megawatt
O&M	Operations and maintenance
ONEE	“Office National de l’Electricité et l’Eau Potable”
OPIC	Overseas Private Investment Corporation
PPA	Power purchase agreement
PPP	Public-private partnership
PTC	Production tax credit
PV	Photovoltaic
REIPPP	Renewable Energy Independent Power Producer Procurement
ROC	Renewable energy certificate
RPO	Renewable energy obligation
RPS	Renewable portfolio standard
t	trillion
UN	United Nations



Methodology

What makes a market attractive?



Each parameter above comprises a series of up to 10 datasets, depending on the breadth or complexity of that particular parameter. These datasets are converted into a score of one through five and weighted to generate parameter scores, which are then weighted again to produce driver scores and the overall RECAI score and ranking. Weightings are based on our assessment of the relative importance of each dataset and parameter in driving investment and deployment decisions. Each technology is also allocated a weighting based on its share of historical and projected investment. Datasets are based on either publicly available or purchased data, EY analysis or adjustments to third-party data.

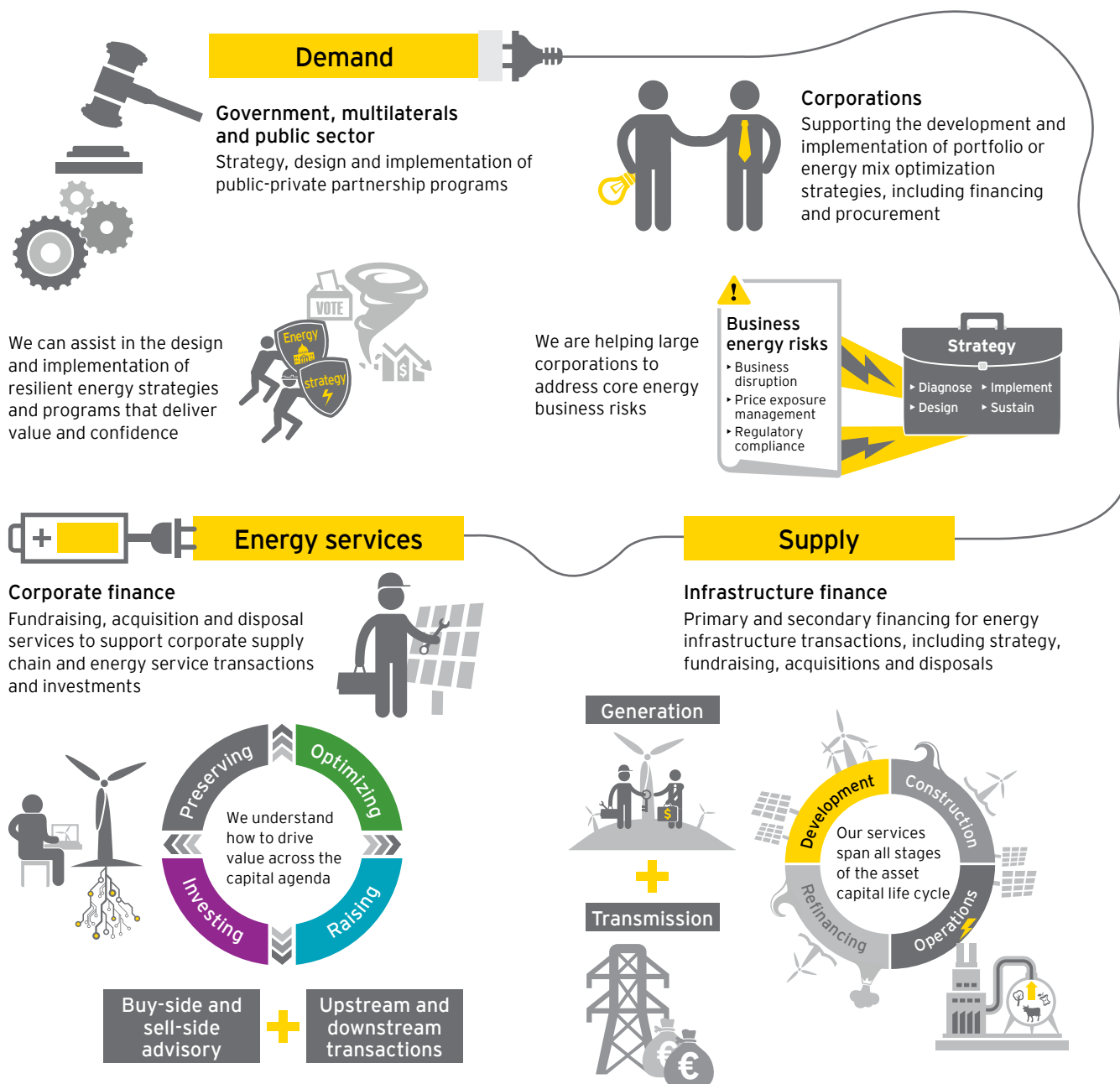
The technology-specific indices rankings on page 20 reflect a weighted average score across the macro, energy market and technology-specific parameters, as some markets can be highly attractive for specific technologies but face other major barriers to entry.

We are unable to publicly disclose the underlying datasets or weightings used to produce the indices. However, if you would like to discuss how our RECAI analysis could assist your business decisions or transactions, please contact the editor, Klair White.

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