

RECAI

Issue 44

Renewable energy country attractiveness index

June 2015

Empowering the Mediterranean

A group of industry experts explores how the Mediterranean region can use a strategic focus on energy to secure its own future and why investment in renewables is about so much more than just keeping the lights on.

Storage: Just another energy asset?

With energy storage still often talked about in either vague or overly-technical terms, it's difficult for investors to get a clear view of the opportunities. The focus therefore needs to be on making this "game changer" just another revenue-generating energy asset.

Feeling positive

This issue sees mainly upward score movements, with predominantly positive developments across the global renewables market in recent months. Governments in particular have been proactive in setting targets and auctioning capacity.



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Renewable energy country attractiveness index

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Chief Editor's note



Ben Warren, RECAI Chief Editor

There is no business as usual. Structural reform in the classic utilities sector is inevitable, as is structural change in the capital markets that serve it. The cost-effectiveness and dispatchability of renewables cannot be ignored by even the most ardent deniers, whatever their agenda. New technologies and new ways of buying and selling power are changing everything.

Policymakers must now focus on enablement rather than intervention and energy providers can no longer simply pick sides. Conventional and renewables both have a role to play, prompting an increasing number of corporate restructurings, spin-offs and joint ventures (JVs). At the same time, previously niche funding vehicles such as yieldcos and green bonds are now mainstream, putting the emphasis on aggregating assets, driving down transaction costs and drawing in new pools of capital through innovative conduits.

The sector must also adapt to a more consumer-centric power offtake model, as rooftop solar and other off-grid generation solutions provide greater energy security, cost savings and even revenues for both residential and commercial end-users. This also includes a more geographically diverse customer base as new markets open up.

Meanwhile, solutions enabling greater renewable energy penetration, such as storage, grid interconnections, energy efficiency and demand management are also quickly becoming investable assets in themselves. This issue highlights, in particular, the attractive opportunities presented by energy storage and smart street lighting.

The decoupling of supply and demand that arises from the flexibility offered by such solutions, combined with a more empowered consumer, should increasingly force the energy sector to ask what is required, why, when and by whom when constructing the investment for new projects. Our feature on unlocking the potential of the Mediterranean region highlights the opportunity for a more strategic focus on energy security to be a catalyst for broader economic and societal benefits.

Business as usual is no longer an option. Survival in the energy market of tomorrow requires new thinking and perhaps most critically, a more diligent focus on the needs of customers.

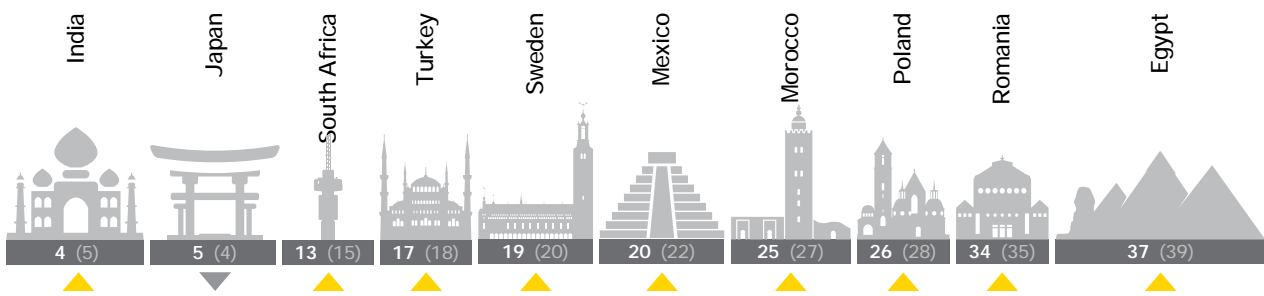
Ben Warren
Global Power & Utilities Corporate Finance Leader

At a glance ...

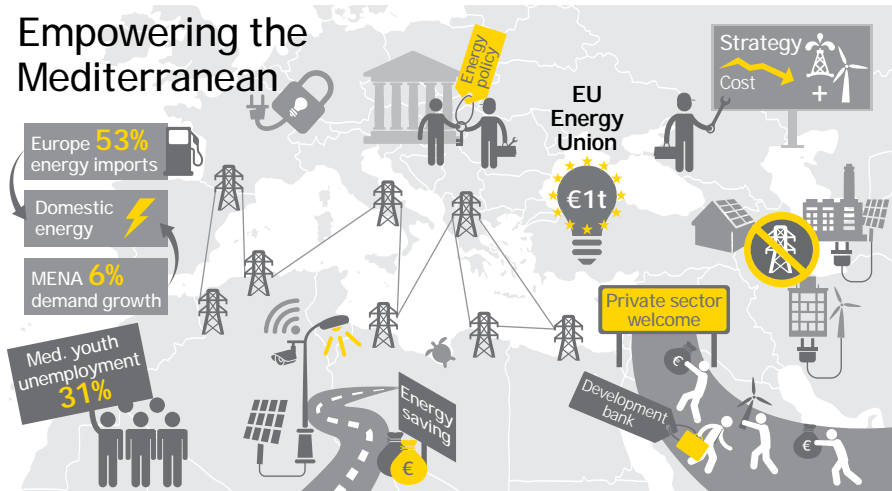
An energy security imperative could help to unlock the investment potential of the Mediterranean region, while energy storage solutions are providing investors with new opportunities to generate secure long-term predictable returns.

Key index movements

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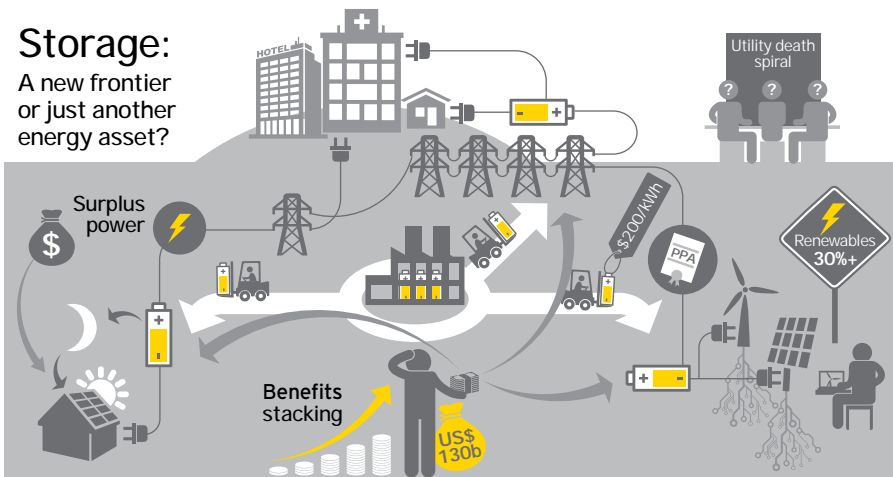


Empowering the Mediterranean



Storage:

A new frontier or just another energy asset?



Quarterly developments

Where's "hot" ...

India
Cashes in

Morocco
Completes

South Africa
Ramps up

... and "not"?

Australia
Agrees ... for now

France
Backtracks

Japan
Moves the goalposts



Summary

An overview of this issue

Unlocking the potential of the Mediterranean

With many countries in the Mediterranean basin continuing to suffer in the wake of the global financial crisis and the social and political unrest of the Arab Spring, the recent EY Strategic Growth Forum® (SGF) in Rome explored whether the region can use energy to secure its own future. Our feature outlines the key findings of a panel discussion with some of the industry's key players.

The potential of renewable energy deployment was identified as an increasingly cost-effective way to tackle energy security issues, as well as create job-heavy industries and economic growth through more sustainable and competitive energy markets. This is particularly the case where distributed generation becomes a critical means of overcoming the challenge of aging or absent transmission infrastructure.



The diversity of markets making up the Mediterranean region also creates opportunities for cross-border integration to achieve a more efficient allocation of energy resources, and enable both supply and demand solutions. Our SGF energy sessions highlighted, in particular, the potential for energy-efficient street lighting to drive significant cost and energy savings for municipalities, as well as provide a range of other benefits.

However, it is also acknowledged that using energy security as a catalyst for broader job creation and economic growth requires a more strategic alignment of interests across governments, industry and civil society, creating responsibilities for different stakeholders.

For policymakers this is a shift from intervention to enablement, creating a level playing field across different energy sources and removing barriers to competition. For industry, it is prioritizing cost reductions and flexible business models as a means of driving sustainable and competitive energy markets. And for investors, it is critical to develop innovative financing solutions that enable new sources of capital to enter the market and address the need to fund projects at different scales and levels of risk.

The very clear message for all stakeholders, however, is that empowering the Mediterranean is about much more than just keeping the lights on.

Storage: Just another energy asset?

The widespread commercial application of energy storage technologies is often described as a game changer. And it is. However, with many storage technologies already proven and costs falling fast, it's not about waiting for the game to change. It already has, and business as usual is no longer an option. It is now time therefore, to focus on developing a clearer view of the investment opportunity, the business models and the most suitable markets.

Though the storage value chain is not dissimilar to a typical energy infrastructure asset, the various challenges that storage is trying to address will determine the most relevant technology, applications and revenue drivers that, in turn, define the business models that can be applied. We explore three such models: (i) generation, (ii) grid support; and (iii) behind the meter.

Each brings its own unique challenges and opportunities, including, for example, the potential for end-user price arbitrage, compensation for benefits stacking and determining the stakeholders best placed to own or operate the storage assets.

In all cases, however, the focus should remain on creating an investable asset class that delivers the necessary returns to generate the funding required to make this game changer just another energy asset.

Getting strategic

Deal activity in the first half of the year suggests a far more strategic approach to bolstering market positions, with an increasing number of JVs, particularly focusing on emerging markets. Large corporations are also increasingly seeking opportunities to lower energy costs, while simultaneously providing attractive investment portfolios.

Index optimism

The last few months have generally been encouraging for the global energy sector, with most movements in the rankings reflecting positive market developments.

China retains the top spot given the continuing speed and scale of its renewable energy deployment, likely to be boosted further by efforts to open up its market to private and foreign investors as it publishes its first detailed energy reform plan in over a decade.

India's jump into fourth place ahead of Japan takes the spotlight in the top ten, having received more than 266GW of commitments to support



the country's clean energy transformation. The Indian Government is also looking to increase the renewables obligations on large energy distributors and use currency hedging to make solar even more cost-competitive.

Capacity confidence

Meanwhile, the success of South Africa's national procurement program has prompted a 6.3GW expansion, providing developers with greater certainty over future demand for capacity and helping the country move up to 13th place.

The release of an ambitious action plan targeting 61GW of renewables capacity by 2023 takes Turkey up to 17th place, while Mexico's emission reduction commitment and investment in new wind capacity takes it to 20th place.

In Africa, the financial close of Morocco's mega-scale CSP projects and Kenya's rapidly increasing project pipeline help these markets move up the index to 25th and 33rd place respectively. Egypt is the real star, however, climbing two places to 37th after re-entering the index last issue and reflecting the phenomenal pace of growth as developers flock to build gigawatts of capacity in this increasingly attractive and stable market.

In Eastern Europe meanwhile, Poland and Romania are starting to show signs of recovery after experiencing almost two years of investment stalemate prompted by policy delays and U-turns.

Poland's pending tender program is giving developers greater certainty over future demand while Romania



is engaging with the market to determine the optimal support structure.

Wait and see

Elsewhere in Europe, it's likely to be an interesting year for both Germany and the UK. While neither experienced a shift in the rankings this issue, our focus articles highlight the mixed responses to Germany's first competitive auction, while a surprising election outcome in the UK has unsettled the renewables sector yet represents a window of opportunity for policymakers.

Meanwhile, Japan's renewable ambitions appear to be wavering in light of a less-than-ambitious emissions reduction target, a potential return to nuclear and slow progress in liberalizing the energy market, contributing to its slip down to fourth place.



Empowering the Mediterranean

April saw more than 600 CEOs, policymakers, investors and entrepreneurs convene in Rome for EY's Strategic Growth Forum (SGF), focused on unlocking the potential of the Mediterranean region. Joined by a group of high-profile panelists, our Global Power & Utilities Leader, Alison Kay and Global Power & Utilities Corporate Finance Leader, Ben Warren explored whether the region can use energy as a way of securing its own future.

Most of the countries of the Mediterranean basin share at least two things in common – unsustainably high unemployment and a lack of secure affordable energy. The real question is whether the second can help to solve the first.

With both the northern and southern shores of the region continuing to suffer in the wake of the global financial crisis, and parts of North Africa still recovering from the political and social unrest of the Arab Spring, high domestic unemployment and the loss of talent to other markets are exacerbating economic recovery and vice versa. The Mediterranean's youth unemployment rate is particularly concerning, averaging 31% compared with a global average of around 12%. As a result, the region risks generations' worth of lost economic development, or at the extreme, failing to recover at all.

Top of the agenda

At the same time, the region is facing an energy crisis. In the north (Southern Europe and Turkey), the stark reality of Europe's vulnerability as a net energy importer and the pending closure of a large number of aging conventional power plants has reignited talk of an EU-wide energy market and reinforced the need for aggressive renewable energy targets. The EU imports more than 53% of its energy, while an estimated 138GW of new thermal capacity will be required over the next 11 years to maintain system adequacy.

Meanwhile, population growth and improved living standards are driving average annual energy demand growth of up to 6% in the southern and eastern Mediterranean countries, i.e., the Middle East and North Africa (MENA) region for this purpose. Although this part of the Mediterranean region is currently a net exporter of fossil fuels on aggregate, the pressure to meet this surging energy demand is jeopardizing export revenues and prompting a focus on diversification.

The goal of energy security has therefore risen rapidly to the top of both political and boardroom agendas across the entire region. In less mature MENA markets in particular, keeping the lights on has

become almost synonymous with maintaining social order given its importance in driving economic development, making energy a top priority no matter who is in government.

Unsustainable models

Most MENA governments have also realized that it is no longer financially sustainable to continue with the standard practice of intensive fossil fuel energy consumption at highly subsidized prices. In his SGF energy keynote speech, Massimo Mondazzi, CFO of Italian oil and gas giant Eni, also reinforced the role of renewables in helping to address the unsustainability of the region's current gas export model. North Africa is the third largest supplier of natural gas to the EU after Russia and Norway, with Algeria, Libya and Egypt accounting for 15% of the EU's total gas imports in 2013. However, Mondazzi notes that subsidized prices have resulted in reduced gas production and investment in new capacity, at the same time as domestic demand in North Africa is increasing.

Both result in reduced availability of gas for export (and therefore lower revenues), at a time when gas is also becoming increasingly important in Europe as a means of balancing the increasing penetration of renewable energy, and addressing supply gaps as more coal and nuclear plants are retired. Mondazzi therefore concludes that, while conventional sources such as oil and gas should remain firmly in the picture as a means of meeting demand and providing baseload power, accelerated renewables deployment



Accelerated renewables in MENA is needed to improve trade balances and revenues by freeing up conventional energy resources for export.

Massimo Mondazzi, Eni



in MENA is needed to improve trade balances and revenues by freeing up conventional energy resources for export, as well as boosting domestic energy security and driving domestic job creation.

The renewables engine

The increasing scalability and affordability of renewables positions the sector as a potential engine for both economic growth (as cheaper energy results in higher disposal income), and sustainable jobs, with opportunities emerging across the whole energy value chain. This includes support functions such as technical, financial and legal services, as well as more industrial manufacturing, construction and operations activity.

Expansion of the distributed renewable generation market in particular, can also overcome the challenge of aging or absent transmission infrastructure. Renewables currently account for around 25% of the EU's electricity supply but this is forecast to rise to 50% by 2030. Meanwhile, MENA is targeting 75GW of renewables by 2030, from minimal installed capacity today.

Getting strategic

The significant potential to generate economic and societal benefits from the creation of job-heavy domestic energy industries should therefore trigger a more strategic alignment of interests across governments, the private sector and civil society.

Investment in domestic energy infrastructure can tackle unemployment as well as secure domestic energy needs. The new energy sector (i.e., renewables, storage, energy services and data) is drawing in some of the world's best talent and importantly, has the attributes to be well-aligned to education through R&D, providing the potential for greater talent retention in the region.



Governments simply need to remove all artificial barriers that prevent energy sources competing on a level playing field.

Carmelo Scalone, EDF Énergies Nouvelles

Leaving the market alone

At a policy-level, this means implementing policies that help, or at least do not hinder, businesses to create jobs. However, a change in mindset is also required. In the wake of energy market distortions resulting from a prolonged period of subsidies and intervention across many parts of the region, and as renewables in particular become increasingly cost-competitive, it is arguably time for the market to be left alone.

As a long-term goal, policymakers should be looking to shift from intervention to enablement, creating market conditions that allow business to sell the energy goods and services that customers demand and that reflect the true cost (and value) of energy.



Jordan has transitioned from a market heavily distorted by subsidies to one in which the private sector is driving affordable energy.

Khaled Irani, E2E

To a large degree this involves negative enablement. According to Carmelo Scalone, Vice President of Business Development at EDF Énergies Nouvelles, governments simply need to remove all artificial barriers that prevent energy sources competing on a level playing field, such that neither conventional nor renewable energy receive any kind of special treatment.

Avoiding distortions

Electricity price subsidies in particular, can also have an unintended detrimental societal impact, typically benefiting the highest income groups as the largest energy consumers, rather than the lowest income groups, the supposed beneficiaries. It is estimated that the EU alone can spend up to €140b (US\$160b) per year directly or indirectly on consumption, fossil fuel and renewables subsidies. Failure to enable cost-reflective tariffs will also typically act as a disincentive to the most efficient allocation of resources and prevent further investment in energy capacity or infrastructure, as well as putting a strain on public budgets.

Khaled Irani, CEO of clean energy solutions company E2E, points to Jordan as an example of the successful transition from a market heavily distorted by energy consumption subsidies and reliant on imports for 96% of its oil and gas (representing around 20% of GDP), to one in which market pricing and private sector participation is accelerating the deployment of increasingly affordable domestic renewable energy. Irani also notes that policy can act as a barrier between customers and the market; the commercial solar rooftop market in Turkey, for example, is being hindered by restrictions on the direct sale of electricity to end-users.

Harry Boyd-Carpenter, Senior Banker for Power and Energy Utilities at the European Bank for Reconstruction and Development (EBRD) also notes that a competitive market with price signals is important for determining and internalizing the economics of different generation sources, including the cost of carbon and, looking further ahead, the arbitrage value of emerging storage technologies.



Competitive foundations

Policymakers arguably therefore have a responsibility to remove legislative barriers to competition and establish a stable environment in which it can flourish. Specific enablement measures might include, for example, the creation of an independent regulator; removing foreign ownership restrictions; unbundling or reforming state-owned utilities; removing restrictions on energy trading or the ability of incumbent utilities to offer multiple services; supporting technology transfer; and enabling the value of power supply or grid reliability and flexibility to be reflected in network tariffs. As decentralized generation becomes more mainstream, effective market design must also enable signaling and pricing for off-grid applications.

Marco Perona, EMEIA Commercial Director at RES Group, also highlights the importance of policy enablement relating to project development, including the need to reduce complexities around land rights, planning, environmental requirements and grid connections, and creating standardized processes and documents to help reduce transaction and due diligence costs.

Learning lessons

However, the success of both short-term and long-term enablement measures also requires learning from the past. While the damaging repercussions of setting overly generous or unchecked renewables tariffs, as happened in Spain, Italy and other European markets, is now well documented and requires little further commentary, the real lesson is arguably more about the importance of monitoring the net economic and social impact of policy measures, in order to avoid boom-bust cycles.

At the same time, our panelists agreed that it should be recognized that the call for a shift away from relatively blunt policy tools such as feed-in tariffs (FITs), toward a suite of enablement measures, also makes the work of a policymaker more complex and sophisticated in the context of the current energy transformation. Particularly when demand-side measures are also considered. Energy and investor communities must therefore exercise some degree of empathy and patience with policymakers, as well as participating in dialogue to help identify and execute constructive legislative reform.



The renewables sector is experiencing a period of Darwinian selection – developers will need to drive down costs to remain competitive.

Massimo Derchi, ERG Renew



The interest of large utilities and oil and gas companies in renewables as a core part of their business model is a genuine game changer.

Marco Perona, RES Group

The next industrial revolution?

A key part of sharing this responsibility is for industry to resist the temptation of “subsidy shopping” and instead focus on creating sustainable business and project models that attract and retain talent, and spur future opportunities through a self-reinforcing GDP-energy growth cycle

Massimo Derchi, Managing Director of ERG Renew sees the renewables industry in particular experiencing a period of Darwinian selection as it matures into a fully fledged infrastructure sector. Project developers wanting to stay around for the next 5 to 10 years will need to challenge themselves on how they can drive down costs to remain competitive, particularly small or mid-size players. According to Derchi, ERG Renew is, for example, in the process of internalizing operating and maintenance functions in order to avoid the profit margin incurred by outsourcing such services, as well as establishing closer ties with manufacturers. There should also be concerted effort across the sector to reduce soft costs, such as financing and transaction costs.

Perona agrees that competitive pressures will alter the operating model of businesses in the sector, predicting a shift from market pricing to cost-plus margin pricing. He also notes that, although the energy sector has been described as being at a “tipping point” for a while now, the interest of large utilities and oil and gas giants such as EON and Eni in renewables deployment as a core part of their business models is a genuine game changer for the sector.

However, he also admits that larger players are better equipped to manage country risk through geographical and technological diversification, while this remains a barrier for small and mid-size players expanding into new markets. Giving Egypt as an example, where project attractiveness is relatively high but shareholders perceive a high degree of country risk, Perona calls on the sector to be more proactive in differentiating between real and perceived country risks, seeking ways to break down the former and dispel the latter to avoid otherwise attractive projects getting stalled in investment committees.

It is also recognized that the rise of the “prosumer” (producer-consumer), combined with aging transmission networks in Europe and a lack of infrastructure in MENA, have significantly increased the opportunities for decentralized renewables generation, microgrids and behind-the-meter services. This consumer-centric



focus is already generating new business models such as leasing, crowdfunding, net metering, pay-as-you-go schemes and data management solutions.

Invest and aggregate

However, policy enablement and a more competitive energy industry will only have limited success driving a sustainable job market without the capital to fund this energy sector transformation.

This rapid growth of off-grid generation such as residential or commercial rooftop solar, for example, introduces scope for more innovative funding models and sources of capital as the finance community gets increasingly comfortable with asset aggregation as a means of creating investments of sufficient scale. This can also reduce high transaction and financing costs that may otherwise make smaller-scale projects uneconomical. This is particularly helpful for capital providers with limited in-house sector-specific expertise, as is the case for many institutional investors.

Such aggregation is also the foundation of the yieldco model. While mainly a US and UK phenomenon to date, a recent announcement by SunEdison could catapult this particular funding vehicle into emerging markets such as the MENA region. The US solar giant plans to raise as much as US\$700m through an initial public offering of TerraForm Global Inc., a traded subsidiary with 757MW of renewables assets in developing nations and rights to buy further projects totaling 1.9GW of capacity.

However, Derchi warns that while the yieldco concept is a good idea given it allows developers to release assets from the balance sheet to enable investment in new projects, it also risks becoming like a wild animal that needs to be constantly fed, potentially raising the price of assets as they increasingly become linked to the expectation of future gains.

Putting development banks out of business

Developers will likely continue to rely on national and multilateral development banks to fund large-scale power projects in the immediate term. But Boyd-Carpenter also identifies renewables as a route to greater private sector investment, commenting that paradoxically, development banks such as EBRD are actually trying to find ways to put themselves out of business by creating the right market conditions for private sector investors to step in.

According to Boyd-Carpenter, the EBRD remit is to support the transition from command to market economies, and from unsustainable to sustainable markets that are much less reliant on hydrocarbons. He makes the point that development banks don't have the resources to meet the huge scale of investment needed. Therefore, setting robust and sustainable foundations for private sector investment is critical. The investment community itself must also recognize this to avoid prolonged overreliance on such funds or the misperception that private funding is being crowded out.

A new investor class

In the call for new sources of capital and funding vehicles, Scalone observes that it is also encouraging that large energy consumers such as Apple and Google are putting their money on the table by investing in renewables. While this has mainly been in the US to date, it is a model that should easily be replicable.

While Scalone believes that utilities, institutional investors and the renewables arm of infrastructure funds will remain the main capital providers for energy deals in Europe in the short term, large energy consumers will become a more prominent investor group in the medium and long term as grid parity makes corporations indifferent between conventional and renewable energy. This will in turn open up more opportunities for onsite generation or direct power offtake models for project developers and independent power producers (IPPs). In 2014, corporate power purchase agreements (PPAs) in the US represented 23% of all wind power contracts, with expectations that corporates will represent at least 25% of all US solar and wind purchases in 2015.

However, it should perhaps also trigger a call to action for governments and energy providers to use energy cost savings and reliability of supply to lure new businesses into markets where these are sufficiently high to create attractive operations models for potential entrants. This would have the dual effect of creating job opportunities across both energy providers and corporate energy offtakers.

The green sukuk: Untapped potential?

To encourage the participation of more private sector small and medium enterprises across the energy value chain – in the MENA region particularly – investors should also take account of a country's track record for large-scale infrastructure deals when setting terms, even if the precedent for renewable energy deals specifically is more limited. Saudi Arabia's substantial track record of IPPs, for example, has made local banks more familiar and comfortable with financing the energy sector. Saudi is also home to the world's first international 30-year sukuk – a US\$1b issuance by Saudi Electricity Company in April 2013. While green bonds have now become relatively mainstream, eyes are turning to the largely untapped green sukuk market, tradable Islamic finance instruments that are compliant with the principles of Shari'ah (prohibiting investment in certain industries).



Development banks can't stay in markets indefinitely – setting sustainable foundations for private sector investment is critical.

Harry Boyd-Carpenter, EBRD



While often described as Islamic bonds, some types of sukuk have equity-type risk-sharing structures, though all will typically be asset-backed and entail a profit sharing feature. Although there are few examples of renewable energy-specific sukuk to date, more than 800 issuances totaling US\$65b were issued between 2001 and 2012 to finance infrastructure projects, including conventional power assets. Total sukuk issuances reached an estimated US\$130b in 2014 alone, and access to a growing Islamic liquidity pool (with assets surpassing US\$2t in 2014) in addition to the conventional investor base, creates significant potential for the creation of a green sukuk market.

Illuminating the road to energy efficiency

The quest for energy security is about more than just attracting investment to increase supply. With demand reduction arguably the quickest way to instantly reduce exposure to energy risks, this puts the spotlight on the potential for energy efficiency measures across the region, yet another source of job creation.

In a global energy productivity survey undertaken by Philips, it was found that of all the energy we consume globally, only 2% is being used for the service it was meant for while the other 98% is wasted. According to the report, making energy efficiency improvements could create 6 million jobs by 2020 (1.2 million in Europe alone), reduce import dependence on fossil fuels by 35% and boost average GDP growth by 1.5%.

Gregor Paterson-Jones, Managing Director for Energy Efficiency at the UK Green Investment Bank observes that the European financial crisis, although difficult, has put some much-needed pressure on local authorities and governments to address the fact they don't have the budgets to cover high energy costs anymore. This has prompted the public sector to start putting tools in place to help the private sector create business plans for energy efficiency projects.

According to Harry Verhaar, Head of Global Public & Government Affairs at Philips Lighting, smart street lighting is one of the most simple and cost-effective ways to generate energy and cost savings given lighting can represent around half of a city's energy bill. Philips estimate the installation of new street lighting solutions can save up to €10b (US\$11b) in global energy costs per year, almost a third in Europe alone.



Smart street lighting is one of the most simple ways to generate energy and cost savings – lighting can make up around half of a city's energy bill.

Harry Verhaar, Philips Lighting

Cost savings in the spotlight

Although the initial upfront cost of street lighting upgrades can still be relatively high, savings arise from reduced operating, maintenance and replacement costs, in addition to lower energy consumption, making the switch almost or fully cost neutral. Light-emitting diode (LED) lamps, for example, typically last for 20 to 25 years, compared with 3 to 6 years for conventional lighting.

Verhaar also notes the significant potential to couple street lighting with solar PV cells to generate additional energy and cost efficiencies, particularly as distributed solar technology advances and removes the need to put cables in the ground.

Research by McKinsey concludes that the cost of low-energy street lighting has been dropping by around 30% per year and that by 2020, the energy saving compared to today's conventional lighting is expected to reach 90%.

Beyond the light

However, Dr. Steven Fawkes, CEO of EnergyPro Ltd., comments that while energy efficiency was previously sold on energy savings alone, that is no longer sufficient to spur the required interest and investment. The co-benefits of smart lighting need to be better highlighted, including for example, hosting mobile phone boosters, wifi, electric vehicle charging points, internet-enabled cameras, sound detectors (e.g., gunshot detectors in the US), or sensors to help with congestion management, identify overcrowding or trigger waste collection alerts.

The creation of intelligent central management systems with the ability to remotely monitor and control lighting functions relative to the needs of a particular area, also generate the potential for additional energy and cost savings. Existing legacy systems only enable lights to be on or off, while LED lights can be controlled with high precision, dimmed rapidly and adjusted continuously to create the level of visibility and sense of safety required, while reducing wasted energy.

Getting smart

Intelligent street lighting is also a critical foundation for broader smart city ambitions. Once data starts to flow in an open way between traditionally closed or proprietary city infrastructure such as public lighting, traffic and parking systems, waste and water management and even advertising displays, it will be possible to create additional operational savings or revenues from more efficient or enhanced service offerings, as well as improving the quality of living for urban residents.

Navigant Research forecasts that the number of smart cities worldwide will quadruple, with at least 88 cities by 2025. The global smart city technology market is predicted to be worth more than US\$27.5b annually by 2023, compared with US\$8.8b in 2014. Fawkes takes the view that while around 80% of the smart cities agenda is over-hyped, at least 20% is based on very real technologies and benefits that can be rolled out now, with a large majority of this around lighting.



Making it happen

While the economic and environmental case for energy-efficient street lighting is compelling, investment to date remains relatively low. According to Paterson-Jones, the main barrier to increased deployment of energy efficiency measures such as smart street lighting isn't really about lack of available capital. It's much more about the lack of resources, particularly in the public sector, to translate a technical case into a business case and reach a state where it will attract third parties to convert the available funding into a reality. In short, investors need creditworthy counterparties and credible business propositions.

For Fawkes, standardization of processes, procurements and documentation is also a major issue, commenting that it is difficult to calculate cost savings and have confidence in the results if everyone is doing something different. Lack of standardization also increases transaction costs and makes it harder to aggregate projects, which is important for large investment propositions. However, he notes that initiatives such as the Investor Confidence Project Europe, are working to develop a common set of procedures and standards for energy efficiency and building refurbishments. The potential for benefits stacking from the various applications of smart street lighting should also be captured in any business case by finding ways to quantify and monetize the benefits.

Piecing together an investable asset class

Notwithstanding, a number of energy-efficient street lighting programs and projects have already been rolled out across the Mediterranean region, including in Egypt, Turkey, Morocco and Spain, while Lebanon, Jordan and Palestine all have National Energy Efficiency Action Plans.

However, Fawkes notes that the current state of the energy efficiency transformation in the region is like a jigsaw puzzle. Everyone is focused on making their piece perfect but there is still a need to bring all the pieces together. In particular, he comments, we need to move away from the view that energy efficiency and smart lighting is only about government-led projects. Even if we say it should be a public expenditure, there's simply not enough money to fund it.



The main barrier is lack of resources to translate a technical case into a business case, and convert the available capital into projects.

Gregor Paterson-Jones, GIB



We need to create more of a market for energy efficiency that turns it into an asset class that debt and equity markets can really engage with.

Steven Fawkes, EnergyPro Ltd

As a result, we need to create more of a market for energy efficiency to turn it into an asset class that debt and equity markets can really engage with. According to Fawkes, the day you can buy an energy-efficient PPA the same way you can buy a gas or wind PPA, it becomes an investable asset class.

Verhaar concludes that, while energy efficiency is half of the equation to putting us on path to a sustainable energy equilibrium, we still need to get it much more into the minds of policymakers before the Paris COP21 climate change talks in December. This can be achieved by demonstrating that energy efficiency is also key to unlocking economic and job growth, and can generate benefits for voters beyond just energy savings.

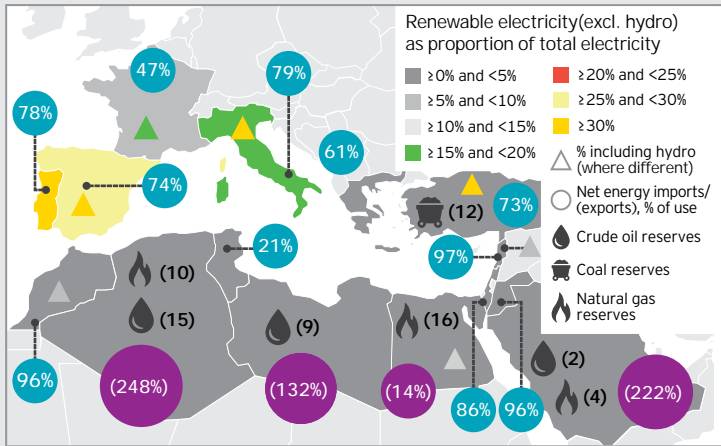
An efficient allocation of resources

In trying to unlock the supply and demand benefits of greater energy security, many now believe self-sufficiency at a national level is no longer sensible or efficient. The Mediterranean region in particular offers a range of opportunities for cross-border integration to achieve a more efficient allocation of energy resources, both between and across the Europe and MENA regions.

Greater regional cooperation also has the potential to create competitive energy markets more quickly as knowledge and R&D is shared, synergies exploited, broader capital markets tapped and deployment of new infrastructure scaled up. Physical interconnections in particular will not only create immediate job opportunities, but also reduce power prices for end-users given a more effective flow of power from where it is produced most cheaply to where demand is highest. Despite the fact that wholesale prices are falling, European post-tax household electricity prices are now around 40% above those in the US.

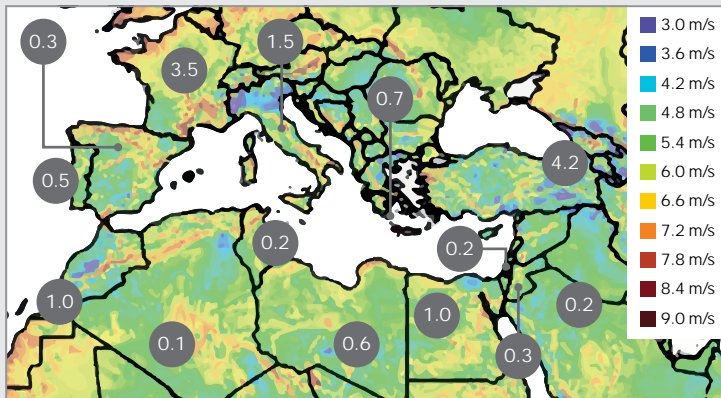
A more efficient allocation of resources across borders should also help reduce the risk of overcapacity, which has pushed down margins in recent years. According to a World Economic Forum report released in January 2015, suboptimal deployment is estimated to have cost the EU around US\$1b more than if each country had invested in the most efficient capacity relative to its natural resource, with the potential for a further US\$40b saving had this approach been applied across borders (with the relevant physical interconnections).

Map illustrating renewables as a proportion of total electricity, net energy imports and fossil fuel reserves



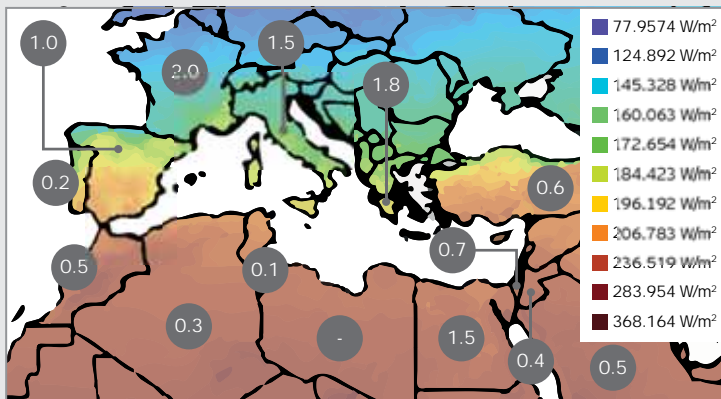
Note: Fossil fuel reserve icons shown only for those countries featuring within the top 20 reserves globally per source, with the respective rankings provided in brackets. Sources: Various (multiple publicly available sources)

Onshore wind speed map and forecast additional GW capacity 2015-18



Sources: 3TIER (Global wind dataset 5km onshore wind speed at 80m height); EY analysis based on multiple market forecast and project pipeline datasets

Solar PV irradiation map and forecast additional GW capacity 2015-18



Sources: 3TIER (Global solar dataset 3km height); EY analysis based on multiple market forecast and project pipeline datasets

Uniting targets

The case for regional integration has arguably never been stronger. MENA will need to deploy a significant amount of new capacity in response to surging energy demand while Europe imports 53% of its energy – a large proportion from Russia – and is due to retire almost 50% of its electricity capacity in the coming decades. Increased flexibility over the shifting of supply and demand across the whole region will also help accommodate variable power flows resulting from an increasing penetration of renewables as it becomes increasingly cost-effective.

This prompted the announcement of plans for an EU “Energy Union” in February 2015. The European Commission estimates that at least €1.0t (US\$1.1t) needs to be invested in Europe’s energy sector by 2020 to improve reliability and competitiveness, including €140b (US\$149b) in storage and high-voltage transmission capacity.

February’s announcements were also used to reinforce the EU requirement for each Member State to be able to export at least 10% of its generating output by 2020, with 12 states currently below this target and therefore likely to be isolated from the proposed internal electricity market. More strategic regional deployment of new generating capacity will also likely be critical to achieving the EU’s 2030 target of 27% final energy consumption from renewables, applied to the region as a whole rather than as binding targets on individual Member States.

Derchi commends the Energy Union proposal as the first document to set out comprehensively all the different factors impacting energy integration, noting the absurdity of having more than 28 different energy policies across the region. However, he concedes that its success will heavily depend on the willingness of Member State governments to transfer some of their sovereignty over energy policymaking.

Getting connected

Steps toward greater regional integration are, however, already underway, including the North-Western Europe day-ahead price coupling project launched in 2014 and a growing number of bilateral interconnections. The Santa Llogaia-Baixas link, for example, will double the electricity interconnection capacity between France and Spain to 2.8GW. Until now, it covered only 3% of peak demand in the Iberian Peninsula, preventing some companies from participating in the EU’s energy markets.

Outside of Europe, the “Eight Countries Electric Interconnection Project” is starting to connect the electricity networks of Egypt, Iraq, Jordan, Lebanon, Libya, Palestine, Syria and Turkey, while the Maghreb regional interconnection was initiated in the 1950s to connect Morocco, Algeria and Tunisia. In late 2014, a tender for the Egypt-Saudi Arabia electricity interconnection project was launched, the first to rely on direct current instead of the alternating current that both countries currently depend on. A 30km subsea cable running across the Gibraltar Strait between Spain and Morocco remains the only transmission link connecting Europe and MENA, although feasibility studies have been carried out on a number of other potential cross-region interconnections.

In addition to a growing number of physical interconnections, there are also various organizations acting as platforms for public-private dialogue and cooperation across the region to exploit synergies and knowledge transfer. These include the Union for the Mediterranean, a multilateral partnership comprising 43 countries that was also responsible for launching the 20GW Mediterranean Solar Plan in 2008.



Desirable but unachievable?

However, while our panelists agreed that greater regional energy market integration is desirable, there was also general consensus that the complexities, cost and political barriers associated with this mean we are unlikely to see any major results in the near term. The challenges faced by high-profile regional integration initiatives such as DESERTEC – which went from a goal of developing 100GW of renewables in MENA for both domestic use and export to Europe, to being a service provider and consulting arm for its three remaining shareholders – also throw into sharp focus the question of whether such ambitious and far-reaching regional energy integration is possible at all.

Further, the case for regional integration as a means of shifting power to address supply and demand imbalances will increasingly find itself in competition with storage applications and off-grid generation.

As such, while it is undoubtedly worth continuing to pursue regional integration in its various forms, the focus should always remain on achieving the most efficient allocation of resources, rather than integration for integration's own sake. As a result, the most likely outcome is a corridor-by-corridor approach that exploits more localized opportunities for cooperation or cross-border trading.

The energy imperative

The Mediterranean is facing an energy security imperative that will require the sector to transform itself over the next decade. Resources are inefficiently allocated both within and across countries; mixed policy experiences have created market distortions; a significant amount of energy is being wasted at the same time that the closure of aging power plants and surging energy demand growth in Europe and MENA respectively are creating greater capacity needs; and the domestic renewable resources best placed to fill this gap will continue to face intermittency challenges in the immediate term.

And yet the potential rewards from tackling these issues go far beyond energy security alone. Cost savings from energy efficiency measures such as smart street lighting; the deployment of increasingly cost-competitive renewable energy; greater use of distributed generation that reduces the need for expensive transmission upgrades; and cheaper electricity from cross-border supply shifting are all within the region's grasp. But critically, all of these things also bring the potential for local industry and job creation across the energy value chain, as well as opportunities for policy and investment communities.

Empowering the Mediterranean

Key to achieving this will be greater engagement and cooperation between governments, private sector and civil society. Our SGF debate revealing the following key actions for stakeholders across the region:

- Energy policy must be about enablement rather than intervention, focusing on creating a level playing field across

different energy sources, removing barriers to market competition and aligning R&D and education with industry.

- Industry itself needs to prioritize cost reduction to make energy more affordable, and supply chain and infrastructure projects more bankable. More sustainable and flexible business models are also required to adapt to a changing generation mix and a more empowered consumer.
- The investment community should continue to develop innovative financing solutions and build on successes to date around aggregation, including for example, yieldco, leasing and bonds (e.g. green sukuk). Private sector investors must also be proactive in stepping in to complement development banks in emerging markets, while large energy users and corporations should be welcomed as a new source of capital.
- Opportunities for energy efficient infrastructure upgrades in cities, including smart street lighting, should be converted into an investable asset class based on credible business cases that quantify the significant potential for broader societal benefits as well as energy and cost savings.

The Mediterranean's quest for secure, affordable and sustainable energy should therefore not just be about keeping the lights on, but rather about creating a strategically important sector that can drive economic growth, attract and retain the best talent, and create competitive and long-term markets for manufacturing, generation and investment.

In short, empowering the Mediterranean simply requires powering the Mediterranean.

Key developments

Country-specific highlights

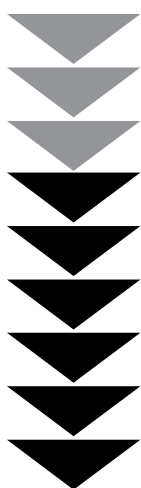
Hot



India cashes in. Delhi's inaugural RE-Invest conference in February saw 293 companies submit Green Energy Commitments representing a staggering 266GW of capacity, while 27 banks committed financing for 72GW of projects. The Export-Import Bank of India has already kick-started fundraising for the country's elevated renewable ambitions, selling India's first green dollar bonds in a 2.75%-yield US\$500m issue in March. The Ministry for New and Renewable Energy is also considering hedging on long-term dollar-rupee exchange rates for solar projects, reducing currency exposure but lowering tariffs to almost at par with conventional thermal plants.

Morocco completes. May saw the Moroccan Agency for Solar Energy (MASEN) reach financial close in record time on the second phase of its Ouarzazate CSP project, raising US\$2b for the 200MW Noor II and 150MW Noor III projects. Combined with the Noor I 160MW site, the Noor CSP complex will be the largest in the world. The close came just two months after MASEN signed 25-year PPAs for the two sites with a consortium led by ACWA, locking in some of the world's lowest thermo-solar tariffs. In March, MASEN also launched the first 50-70MW phase of PV tenders under the Noor solar program, which aims to develop a total 2GW solar by 2020.

South Africa ramps up. The success of South Africa's national procurement program in securing 5.2GW of renewables capacity worth an estimated US\$14b of investment has prompted the Government to propose a 6.3GW expansion of the project. The April announcement coincided with the Department of Energy naming preferred bidders for contracts to build 13 clean energy projects totaling 1.1GW under Round 4. The expansion is also undoubtedly largely driven by the country's rolling load-shedding, with public utility Eskom forced to cut power again in April for the longest period in two months to avert a collapse of the national grid.



Australia agrees ... for now. The Australian Government has finally reached agreement with the opposition to reduce the country's Renewable Energy Target (RET) to 33TWh by 2020, down from 41TWh. However, there is speculation this won't end the policy uncertainty that has plagued the renewables market over the past 12 months, since a scheduled RET review in 2016 could open the door to further changes. New investment in renewables has already dropped 90% in the 12 months to March 2015, and is expected to fall a further 29% under the new target. Such negativity at a national level also overshadows more positive state-level developments (see our *Global view* on page 17).

France backtracks. Just as the renewables sector was regaining some momentum as the long-awaited French energy transition bill finally made its way through Parliament, a proposed amendment to double the exclusion zone around houses and other areas earmarked for future wind development to 1,000 meters could grind projects to a halt and jeopardize the country's 2020 renewables targets. Another amendment dilutes the bill's attempt to reduce the share of nuclear in the energy mix to 50% by removing the proposed 2025 deadline.

Japan moves the goalposts. April's pledge to cut emissions 26% by 2030 has been criticized as insufficient to catalyze a genuine shift toward clean energy. The reduction is based on a 2013 baseline, when Japan recorded its second-highest emissions ever as it burned more fossil fuels to replace lost nuclear power, making the percentage target seem more ambitious than in absolute terms and prompting some in the market to describe it as "almost cheating." Combined with a May government report concluding that nuclear is Japan's cheapest energy source, speculation is growing about its long-term renewables ambitions.

Not

Deal, investment and policy highlights

Joining forces. The theory that “two heads are better than one” seems to be driving an increasing number of JVs, as companies seek strategic alliances to increase their purchasing power or bolster positions in new markets. Mainstream and Actis have recently formed Lekela Power, a US\$1.9b 40:60 JV to develop up to 900MW of solar and wind in Africa by 2018, focusing initially on South Africa, Ghana and Egypt. In Europe, Havgul Clean Energy and Triventus Wind Power will create a pan-Nordic entity to oversee a 1.6GW wind portfolio across Finland, Norway and Sweden, requiring US\$3.5b of investment. Meanwhile, March saw the launch of Adwen, an offshore wind JV between Areva and Gamesa, with 2.8GW of projects under development and the goal of controlling 20% of the European market by 2020.

In the Americas, Abengoa and EIG will invest US\$2.5b in a JV to acquire more than US\$9.2b of new clean-power projects being developed by Abengoa in the US, Mexico, Brazil and Chile. US solar giants First Solar Inc. and SunPower Corp. are also planning a JV to own and operate their power plants, while Mexico's CEMEX has agreed a venture with Pattern Energy to develop at least 1GW of renewable energy projects in the country over the next five years. Looking east, Enel Green Power and Marubeni Corporation are jointly evaluating potential renewables opportunities in southeast Asia.

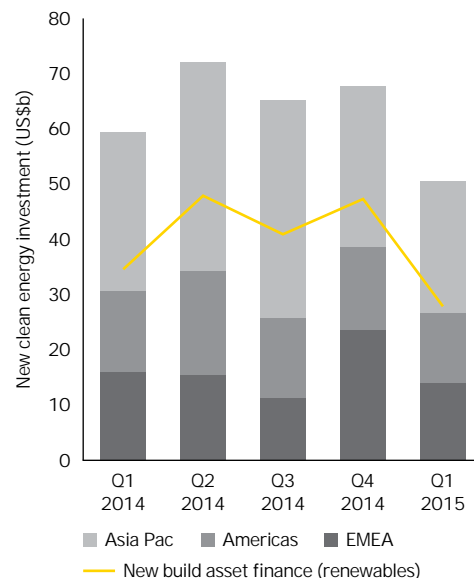
Corporates get in on the act. Large corporations are also getting strategic, increasingly viewing renewable energy projects as both attractive investment opportunities and a means of reducing energy costs. February saw Apple unveil the largest ever non-utility corporate solar procurement deal, a 25-year, 130MW agreement with First Solar worth almost US\$850m. Meanwhile, Apple's manufacturing partner Foxconn Technology Group is in talks with UK investors to raise US\$1.7b for “green initiatives” designed to save energy. February also saw Google surpass its previous renewable energy investment record when it injected almost US\$300m into SolarCity's US\$750m fund for residential solar projects.

Even carbon-heavy industry has begun to embrace renewables, with Dow Chemical signing a 15-year off-take agreement in March to use 200MW of wind capacity to supply at least 10% of the power at its chemical manufacturing site in Texas – the largest in the western hemisphere. It is estimated that as early as 2025, US companies alone could procure at least 60GW of new off-site capacity, compared to just 5GW to date.

Yielding to the market. Yieldco enthusiasm shows no signs of waning, with SunEdison's proposed US\$700m TerraForm Global IPO – scheduled for mid-2015 and focusing on emerging markets such as Brazil, China and India – signaling the growing maturity of a financing vehicle that has mainly featured in Western markets to date. In the East, China's Jinko Solar is planning to float its Jinko Power unit as a publicly traded yieldco during 2015, while Trina Solar is to spin off its fast-growing downstream business via an IPO in the US, Hong Kong or Mainland China. However, the Western yieldco market also remains buoyant, with Spanish construction giant Grupo ACS floating shares in its renewables yieldco, Saeta Yield, in February. Canadian Solar is planning a yieldco to host its expanded asset base following the acquisition of Recurrent Energy, while Enel is also putting the final touches to a yieldco for its US-based renewable assets, although it will not seek to publicly list the company.

New clean energy investment worldwide, Q1 2015

Global clean energy investment of US\$50.5b in Q1 2015 represented a sharp drop on the US\$67.6b of the previous quarter. However, Q1 investment is typically more subdued following the year-end rush to beat tariff cuts or policy changes. The quarter's lower figure also reflected a 15% strengthening of the US dollar against a basket of currencies during the last year and 29% against the euro, making it difficult to match the equivalent dollar value in the same period last year. Last year also benefited from fundraising for a number of high-value offshore wind projects. Regional performance was somewhat mixed in Q1 2015, with investment in Europe and China dropping 30% and 24% respectively on the same period last year, while the US saw a modest 2% increase. South Africa was the shining star, however, with investment surging to US\$3.1b from almost nothing a year earlier, in large due to the project pipeline emerging under its national procurement program.



Source: BNEF project database and *Global trends in clean energy investment* – Q1 2015 fact pack, BNEF, April 2015. Values include BNEF estimates for undisclosed deals. Asia-Pacific includes India

Our index

RECAI scores and rankings at June 2015

(See page 33 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	(1)	China	75.8	1	2	1	3	1	13	1	16
2	(2)	US	73.4	2	8	2	1	2	1	3	9
3	(3)	Germany	66.5	3	3	5	27*	8	8	10	27
4	(5)	India	64.1	5	16	4	5	15	14	6	11
5	(4)	Japan	63.0	14	9	3	26	3	3	4	10
6	(6)	Canada	60.4	4	12	11	23	13	18	5	6
7	(7)	France	59.0	9	7	7	27*	9	15	15	5
8	(8)	UK	58.2	11	1	13	27*	5	20	25	2
9	(9)	Brazil	57.0	6	25	10	8	4	32	2	24
10	(10)	Australia	56.2	19	19	9	9	20	11	24	12
11	(11)	Chile	55.6	25	22	6	2	21	10	17	14
12	(13)	Netherlands	54.3	12	4	23	27*	10	24	32	30
13	(15)	South Africa	54.0	18	28	8	4	33	35*	18	19
14	(14)	Belgium	53.6	26	5	19	27*	11	21	29	31*
15	(12)	South Korea	52.3	23	14	12	24	12	28	16	3
16	(16)	Italy	52.1	24	21	15	11	14	7	14	23
17	(18)	Turkey	52.0	10	24	26	14	34	6	9	20
18	(17)	Denmark	51.8	13	6	32	27*	16	35*	36	17
19	(20)	Sweden	51.4	8	11	36	27*	7	26	12	13
20	(22)	Mexico	50.6	17	30	16	18	31	9	30	21
21	(19)	Portugal	50.5	22	20	25	19	24	17	20	7
22	(21)	Thailand	49.8	32	39	14	25	17	29	35	29
23	(23)	Taiwan	49.3	30	17	17	22	25	19	21	26
24	(24)	Spain	49.2	28	26	21	10	27	34	34	15
25	(27)	Morocco	48.3	27	34	20	6	38	35*	39	31*
26	(28)	Poland	47.9	20	18	33	27*	19	16	23	31*
27	(25)	Austria	47.5	21	39	28	27*	18	22	13	31*
28	(26)	Peru	46.4	37	27	22	17	29	12	7	31*
29	(29)	Israel	46.0	39	37	18	7	37	35*	28	22
30	(30)	Ireland	45.9	7	13	39	27*	22	33	31	1
31	(32)	Philippines	45.6	34	29	29	20	26	5	19	4
32	(31)	Norway	45.4	16	15	38	27*	28	27	8	8
33	(34)	Kenya	45.2	31	33	31	16	30	4	26	28
34	(35)	Romania	44.9	29	31	35	27*	32	25	27	31*
35	(33)	Greece	44.5	35	35	27	15	35	23	38	31*
36	(36)	Finland	44.4	15	10	40	27*	6	35*	33	31*
37	(39)	Egypt	43.6	33	36	34	12	40	35*	37	31*
38	(37)	Saudi Arabia	43.5	36	38	24	13	39	30	40	31*
39	(38)	Indonesia	42.1	40	32	30	21	23	2	11	18
40	(40)	Russia	41.2	38	23	37	27*	36	31	22	25

*joint ranking

Index highlights

While **China's** number one position prevents a rise up the rankings, recent positive developments are still worthy of note. Particularly as March saw the Government publish the first detailed plan on electricity market reform in over a decade, seeking to liberalize the sector, encourage more private investment and introduce the compulsory purchase of renewable energy. The latest forecasts project more than 100GW of additional onshore wind capacity over the next four years, while the Government has also increased the solar capacity eligible for subsidies in 2015 from 15GW to 17.8GW, requesting detailed action plans to achieve this from 26 provinces.

India continues its climb up the index, replacing Japan in fourth place. The latest forecasts estimate around 13GW and 10GW of new wind and solar capacity respectively over the next four years alone, while policy targeting 1GW of geothermal capacity by 2022 is currently being drafted as the first phase of a potential 10GW plan. The Government also plans to increase the renewable purchase obligation of large power distributors from 3% by 2022 to 8% by 2019.

While **Japan** remains an attractive market, evidence by Goldman Sachs recently setting a US\$1b goal for clean power bonds in the country, the relatively weak emissions reduction goal (see *Key developments* on page 12) and push to restart nuclear reactors risk slowing the momentum of the renewables. The country is also making slow progress in liberalizing the power markets by 2016, while new curtailment rules issued earlier this year in response to an overwhelming number of solar applications may in fact give regional utilities even more power to refuse new capacity.

While both the **UK** and **Australia** are currently operating in less-than favorable conditions (see our *Key developments* on page 12 and UK article on page 28), the forward-looking nature of the RECAI has already taken account of these developments in previous issues, leaving both rankings unchanged this issue.

The announcement that the capacity to be awarded under **South Africa's** national renewable energy procurement program will be increased by 6.3GW (see *Key developments* on page 12), has helped move it up to 13th place given the degree of comfort and stability this provides over future project potential. Plans by Public Investment Corp, Africa's biggest money manager, to invest US\$1.8b for 20% stakes in two solar-power plants in the country also indicates an increasingly buoyant investment climate.

The release of **Turkey's** national renewable energy action plan, targeting 61GW of renewables capacity by 2023, almost half from non-hydro sources, has provided greater long-term visibility over demand in the country and prompted a jump to 17th place. It was also revealed in May that more than 42GW of applications had been received for the 3GW of pre-licensed wind energy projects on offer in the country's latest auction process.

With **Sweden** responsible for producing the additional 2TWh of renewable energy under the revised Sweden-Norway joint 2020 target announced in March, new capacity potential takes it up to 19th place. The latest onshore wind forecasts also project a solid 3GW of

additional capacity over the next four years, while the Government is currently planning a new support system for offshore wind, likely to comprise a mixture of direct subsidies and state aid for grid connections, as in neighboring Denmark.

Mexico jumps up to 20th place, being the first developing country to submit an emissions reduction pledge ahead of the UN's 31 March 2015 deadline. The country has committed to curb the growth of pollutants 25% from its current trajectory by 2030. The Government has also announced that it will move ahead with US\$3.5b of investment in new wind capacity over the next three years, despite falling oil revenues putting pressure on budgets. The latest forecasts estimate up to 4.5GW of additional wind capacity will be installed over the next four years.

The financial close of **Morocco's** mega scale CSP projects (see *Key developments* on page 12) puts it firmly on track to meet its 2020 2GW solar target and helps it climb to 25th place. Ongoing solar PV and onshore wind tenders are also laying the foundations for a strong project pipeline.

Poland's new legislation shifting to auction-awarded FITs and premiums from 1 January 2016 was finally signed into law in March, providing the market with a greater degree of policy stability. While the latest wind forecasts of 1.5GW to 2.3GW new capacity in the coming years will inevitably assume a rush to secure green certificates, the figures are still encouraging for a market previously paralyzed by policy uncertainty. Further, amendments to the new law that would have curbed subsidies to small-scale renewables projects were successfully voted against.

Kenya jumps up to 33rd place to reflect a growing project pipeline, as the Government identifies 19 high-priority renewable energy projects that will be fast-tracked in the next five years, requiring an estimated US\$8.7b of investment. Construction of the 60.8MW US\$150m Kinangop Wind Park project is also back on track after local landowners opposed to its development signed a revised agreement with developers in February.

Reports that **Romania's** cabinet is in talks with the energy market regulator and private sector to determine possible changes to the support program that would make renewables investments "profitable again" suggest a more positive outlook for the market. While market analysts remain divided on the outlook, with near- to mid-term onshore wind forecasts ranging between 600MW and 2,100MW and additional solar ranging between 300MW and 500MW, these are still relatively encouraging figures given the recent investment stalemate in the country.

Egypt has moved up to 37th place following its re-entry in Issue 43, reflecting its stable and attractive support regime and rapidly growing project pipeline. Developers have barely paused for breath since the country unveiled its 4.3GW renewables program last September. The Government has also signed agreements with four international consortia in recent months to develop a further 9GW of renewables capacity.

Global view

Recent months have seen mainly positive developments across the global renewables market, with governments in particular being proactive in setting targets, auctioning capacity and upgrading grids.



North America

- March saw **US** President Barack Obama sign an executive order to reduce the US federal government's emissions 40% by 2025 from 2008 levels, a move that will boost its electricity consumption from renewable sources to 30%.
- Meanwhile, the US Internal Revenue Service has issued new production tax credit (PTC) guidance that confirms wind projects under construction prior to 2015 now have until the end of 2016 to become operational and be eligible for the credit, a year later than originally drafted.
- Figures show that in 2014, California became the first US state to generate more than 5% of its electricity from renewable sources. California is also seeking to increase its renewable portfolio standard (RPS) obligation to 50% by 2030, up from 33% by 2020. At the other extreme, however, West Virginia became the first state to completely eliminate previously passed standards, reportedly finding it uneconomical.
- In April, **Canadian** province Ontario announced it would join Quebec's carbon cap and trade scheme. While the timeframe is yet to be confirmed, initial government and third-party estimates indicate it could raise as much as C\$2b (US\$1.6) annually.
- Meanwhile, March saw Ontario's independent Electricity System Operator request proposals for 565MW of renewables capacity, including 300MW of wind and 140MW of solar. It's the first of three auction rounds to meet Ontario's goal of 10.7GW non-hydro renewable energy capacity by 2021.

South America

- In **Brazil**, the Government is to create a US\$6.5b fund to finance up to 8GW of new wind and solar capacity in the country's northeast region, as energy-intensive industries look to renewables to power their factories. It has also eased net metering rules and eliminated various taxes on rooftop solar to encourage the deployment of small-scale renewables by homes and businesses.
- **Chile** is to install an additional 580km of transmission lines by 2017 at a cost of around US\$1b, in order to connect the country's two power grids and existing 3,000km transmission network and better integrate renewable energy projects being developed in the north of the country particularly.
- In **Colombia**, local wind developer Jemewaa Ka'i is looking to build 474MW of onshore wind capacity across three sites, with the aid of European capital.
- **Costa Rica** has proposed a minimum floor price of US\$75.1/MWh and ceiling price of US\$179.4/MWh for new grid-connected solar PV plants less than 20MW.

Europe

- US technology giant Apple is seeking proposals from Ireland's renewable project developers in a €400m (US\$435m) bid to power its new Galway data center. The company needs around 300MW and is therefore seeking a minimum of six projects up to 50MW each.
- In April, Spain's Government announced plans to tender 500MW of wind power, covering both re-powering and new projects. However, the Spanish Wind Power Association has criticized that this is well below the 4.5GW to 6.5GW of wind power the Energy Ministry believes is necessary by 2020 and does not resolve the judicial uncertainty of the current regulatory situation.

- The EU has agreed to provide support to Portugal to develop marine demonstration projects totaling 50MW, generating energy from wave, tidal and innovative offshore wind technologies.
- Russia is considering improving terms for bidders in June's renewable energy auction, including allowing higher capital spending and looser local-sourcing requirements for wind projects. This is in response to a slump in the Russian ruble currency that has raised import costs risks and deterred investors. Russia was also one of the relatively few countries to submit an emissions reduction pledge by the UN's 31 March deadline, committing to limit greenhouse gas emissions in 2030 to a maximum of 75% of 1990 levels.

- The UK's National Grid and Norway's counterpart Statnett have signed an ownership agreement for a 1.4GW power link between the two countries. At 730km, the €2b (US\$2.2b) link will be the world's longest subsea interconnector. Statnett has also agreed with KfW IPEX-Bank and TenneT Holding to build a 1.4GW power link with Germany, requiring a similar investment.
- For Germany and the UK see our articles on page 26 and 28, respectively.

Middle East and Africa

- South Africa's biggest gold producer, Sibanye Gold, plans to invest around US\$260m to develop a 150MW solar PV facility, in order to reduce its reliance on expensive and unreliable power from state-owned power utility Eskom.
- The World Bank has agreed to provide around US\$150m in loans to help finance three solar PV plants with capacity totaling 75MW in Morocco.
- Sustainable Energy Fund for Africa has granted US\$777k to JCM Capital toward project development costs for a 72MW PV project in Cameroon, touted to be one of the continent's largest solar projects
- In Ghana, Home Energy Africa is planning to build a 100MW solar project costing around US\$200m, while the Climate Investment Fund is providing US\$40m to support the installation of renewable energy minigrids and PV systems. The Government hopes the investment will help it increase total electricity generation from the current 2GW to 5GW by the end of 2015.

- Nigeria's federal government has signed a memorandum of understanding with three firms to add 1.7GW of solar capacity to the national grid, with the projects to be self-funded by the companies. They will also contribute toward the Government's target to meet 30% of its electricity generation from renewables by 2020.
- April saw the Dubai Electricity and Water Authority (DEWA) initiate the third phase of its iconic 3GW Mohammed bin Rashid al Maktoum Solar Park, tendering an additional 800MW of capacity. This comes just a few months after DEWA tripled Dubai's renewables target to 15% of the total energy mix by 2030 from the previous 5%, while also introducing an interim 2020 target of 7%.
- Meanwhile, a recent IRENA report estimates the UAE as a whole could save up to US\$1.9b per year by 2030 by increasing the share of renewables in the energy mix to 10%
- For Egypt see our article on page 30.

Asia-Pacific

- The Australian state of Victoria is planning to halve its turbine-to-household distance requirement to 1km to boost onshore wind deployment potential. Meanwhile, Australian Capital Territory has awarded 20-year FIT contracts to three onshore projects with cumulative capacity of 200MW, and Toowoomba Regional Council has approved plans for the A\$1b (US\$780m) 2GW Bulli Creek solar park, the country's largest.
- Also in Australia, the Clean Energy Regulator announced it will write multiyear contracts worth A\$660.5m (US\$510.4 m) with 43 providers of carbon offsets following the inaugural Emissions Reduction Fund auction. This is part of the Government's new A\$2.55b (US\$1.97b). Direct Action policy.
- Researchers affiliated with China's central bank have proposed creating a China Ecological Development Bank with at least CNY100b (US\$16b) in capital as part of a broad plan to boost green finance.
- Japan's Ministry of the Environment has launched an initiative to investigate the potential to install up to 1.45GW of offshore wind at four sites across the country.
- Indonesia's state-owned energy company Pertamina has signed a cooperation agreement with Akuo Energy of France to develop a renewables portfolio totaling 560MW by 2020, covering solar, wind and ocean thermal technologies. Pertamina has also recently announced plans to more than double geothermal capacity in the country to 1,057MW by 2020.
- In Vietnam, the U.S. Trade and Development Agency has awarded grant money to private domestic developer Cong Ly Company Ltd. to study the feasibility of a 300MW third phase of the Bac Lieu Wind Farm in the shallow waters of the Mekong Delta.

Storage: A new frontier or just another energy asset?

It is rare these days to see the word “storage” without also seeing phrases such as “game changing” or “disruptive.” But with energy storage still often talked about in either vague or overly technical terms, it’s difficult for investors to get a clear view of the investment opportunity, the business models and the outlook. So let’s keep it simple ...

Although energy storage is widely hailed as a means of achieving greater energy security while simultaneously enabling increased penetration of renewable energy, what investors really want to know is how storage can deliver a return on capital invested. The simple answer is that storage is providing new services to electricity generators and consumers, thus tapping into new revenue streams. The more complex answer requires quantification of the discrete needs that are being met by storage in financial terms rather than technical terms, varying by application, business model and market characteristics.

Just like the development, construction and operational phases of a typical energy generation or transmission asset, the storage infrastructure life cycle (illustrated below) presents a range of investment entry points depending on the nature of the capital required, the risk-return profile and the exit timeframe.

However, the specific investment opportunity at each stage of the life cycle, and the resulting revenues, will also largely depend on the business model(s) that best reflect the needs of the market and the target customers.

Three such business models have been identified:

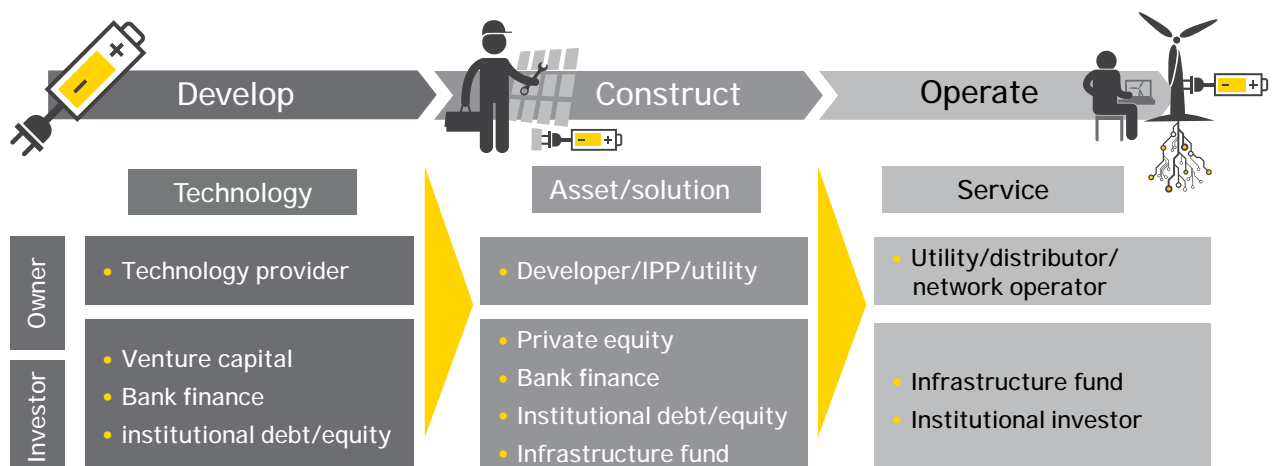
- Generation support
- Grid support
- Consumer support (behind-the-meter)

Each of these models – illustrated on the following page – are driven by the problems that the proposed solution is addressing, namely the various combinations of energy security, energy savings or revenue generation. However, in all cases, the first step is the technology.

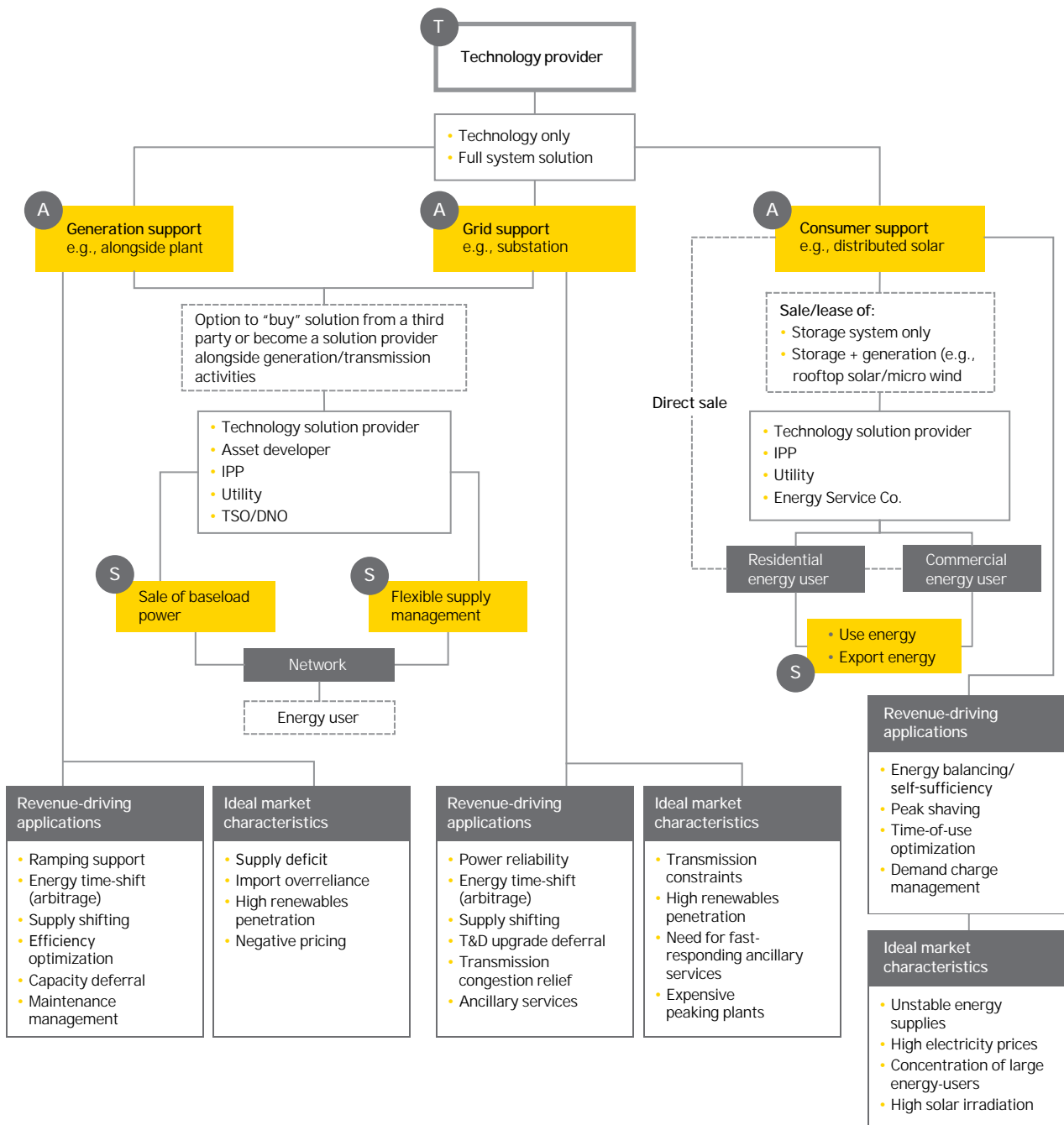
Technology choices

Technology providers will typically have the option to sell the technology in isolation, e.g., the battery alone, or as a packaged “solution” that includes broader system services such as the inverter, software, installation, interconnection and operation. They may also specialize in products of a particular scale that are more suitable for say, behind-the-meter consumer-related applications, compared to larger-scale solutions that may be more appropriate for generators or transmission system operators.

Energy storage infrastructure life cycle



Energy storage applications and business models



Ancillary services – key terms explained

- **Frequency regulation:** balance continuously shifting supply and demand under normal circumstances, usually automatic on a minute-to-minute basis
- **Load following:** continuous electricity balancing following frequency regulation system fluctuations, typically between 15 minutes and 24 hours
- **Voltage support:** inject or absorb reactive power to maintain voltage in the T&D system under normal conditions, usually with discharge duration of less than a minute
- **Reactive power:** the difference between working power (kW) and total power consumed (kVA), generating the magnetic fields that are essential for inductive electrical equipment such as transformers and motors to operate
- **Spinning/non-spinning reserve:** compensate for rapid or unexpected loss in generation: spinning = responses < 15 minutes; non-spinning = responses > 15 minutes
- **Black start:** to manage rare situation where the power system collapse and other ancillary mechanisms have failed – allows electricity supply resources to restart without pulling electricity from the grid

Infrastructure life cycle

- T Technology
- A Asset/solution
- S Service



While a detailed analysis of individual technologies is beyond the scope of this article, there does seem to be general consensus that electro-chemical batteries will become the most popular solution in the decades ahead to meet medium- to long-term energy needs, given the increasing versatility and scalability across a range of applications. Lithium-ion (Li-ion) batteries in particular are scaling up rapidly, although alternative solutions that meet slightly different needs and have different benefits are also coming to the fore, such as vanadium redox batteries.

Battle of the batteries

Few could have missed the launch of Tesla's Li-ion-based energy storage products in May 2015, sparking speculation that mainstream storage systems have now arrived. At a glance, the 7kWh and 10kWh "Powerwall Home Battery" offerings for residential consumers and small businesses, and its 100kWh "Powerpack" unit for larger operations, certainly sound compelling. Particularly when compared to alternatives, given the additional benefits such as a 10-year guarantee.

However, some market analysts have cautioned that the Tesla figures, while encouraging and putting storage firmly in the headlines, only quote for the battery itself, excluding broader system costs. It is the total cost of a storage system and any onsite generation, if any, that must be cost-competitive with other flexible energy system options available, such as energy efficiency measures, demand response controls, increased grid access and other forms of storage and generation. Navigant Research projects that the majority of cost reductions in each technology will come from developments in the systems integration element of the storage value chain rather than the battery. The levelized cost of storage across the whole system is therefore the key metric that should be used to assess the competitiveness of different solutions.

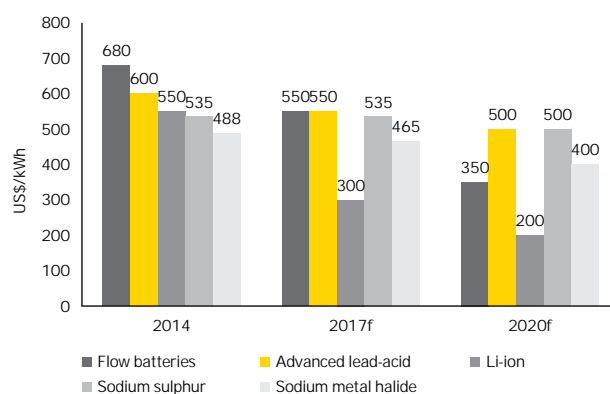
Cost: the only way is down

However, battery costs as a significant system component are still expected to fall dramatically, following a similar cost trajectory to solar modules given that this now relatively proven storage technique has rapidly scaled up in response to growing demand. Li-ion battery costs, for example, are predicted to drop from the current US\$500-700/kWh to US\$200-300/kWh by the end of the decade. The cost of flow batteries is also forecast to almost half by 2020, as illustrated below.

However, it must be remembered that that different battery types boast different response times, discharge times, power ratings, efficiencies and degradation rates, making each more or less suitable for specific applications. Cost trends should therefore be assessed within the context of a technology's strengths and

weaknesses and relative to the opportunity cost. Cost reductions will likely also be spurred by increased supply, with Tesla and Alevio already blazing a trail with multibillion-dollar gigawatt-scale manufacturing facilities in the US.

Forecast lowest current and projected battery cell price by type for utility-scale applications



Source: *Advanced Batteries for Utility-Scale Energy Storage*, Navigant Research, 2014

Beyond the grid

Behind-the-meter solutions, including tying storage into the residential solar PV market or the onsite generation assets of large energy-users, are expected to create business models around microgrids, asset aggregation, shared savings and asset leasing, similar to those across the solar industry. Both the increasing participation of end-users in the energy market and the aggregation of smaller projects into larger pools have been a major stimulus for the renewable energy industry in recent years. Investors have gotten increasingly comfortable with the concept of portfolio-based underwriting and the related long-term revenues. Applying a similar model to storage systems to aggregate contracted and predictable cashflows also opens up the potential for alternative financing instruments, such as project finance, project bonds or finance leases.

In addition to increased energy security, energy users also stand to benefit from cost savings and even generate trading revenues, by physically separating electricity supply from electricity demand. Being able to store electricity at times when either market prices are low or when onsite generation is surplus to requirements will give consumers an option to subsequently discharge this electricity for self-consumption or export to the grid when prices are high. This is a paradigm shift for the electricity industry.

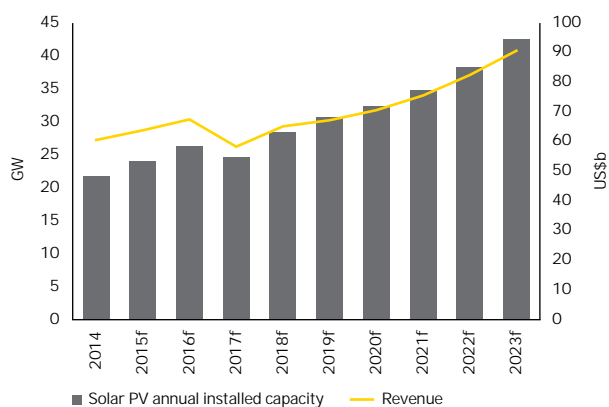


Distributing the benefits

The most attractive markets for end-user storage systems will therefore be those with relatively unstable energy markets, high retail prices and strong solar resource generating more consistent storable energy for use on demand or export into the grid. For the latter, appropriate regulatory frameworks that facilitate the sale of excess power in return for revenue or credits will also be beneficial.

Given the potential multiple benefits for end-users who use storage as a complementary technology alongside distributed generation systems such as rooftop PV, the scale of the opportunity for storage developers and investors is arguably commensurate with the scale of the opportunity for the distributed technology itself. As illustrated below, for example, additional annual global distributed solar PV capacity alone is estimated to reach around 42GW by 2020, almost double the capacity added in 2014 and indicating huge growth potential for residential and commercial storage as a dual product.

Forecast annual distributed solar PV installed capacity and revenue



Source: *Community, Residential and Commercial Energy Storage*, Navigant Research, 2014

However, the potential for price arbitrage at an end-user level must be assessed on a market-by-market basis. In the US, for example, residential electricity rates do not presently offer significant price arbitrage opportunities. Yet at a business customer level, energy storage solution providers are able to propose services to reduce the so-called “demand charge” levied by utilities to pay for their readiness to generate and release power to meet customer needs.

This charge can reportedly make up 50% of a monthly bill where a business customer’s energy needs vary greatly throughout the day or from one day to the next. Such cost mitigation will likely be the main application of storage for commercial and industrial

consumers in the immediate term, with other uses to follow as batteries become cheaper. It is estimated that some 45% of the US storage market will be behind the meter by 2019, compared to less than 10% of new capacity in 2014.

The incumbent utility: Friend or foe?

The potential for storage deployment at the consumer-level does pose a threat to the status quo for utilities, however. The logic that an increasingly decentralized electricity market, exacerbated further by storage technologies will increase the charge for a utility’s remaining customer base as grid costs become shared among fewer users and encourage even greater self-consumption, results in the so-called “utility death spiral.”

The call for utilities to rapidly evolve their business models in order to respond to an energy market in transformation is nothing new, but the growing storage market – and in particular its potential to add value across multiple platforms including ancillary services – should once again prompt utilities to consider how they can participate. Purchasing storage solutions to increase the flexibility of their energy offerings or becoming solution providers themselves, are both options. The consumer-level storage market itself may also be a good fit for utilities, particularly if it can be woven in with other programs such as smart metering. Dramatic or not, one thing is for sure – there is no more business as usual for the incumbent energy provider.

Stacking the benefits

Indeed, the multiple applications of storage solutions under the larger-scale generation and grid support models can create a relatively compelling economic case given the potential for benefits stacking, provided the value of these applications can be quantified. The monetary value of bulk energy services such as time-shift arbitrage and supply capacity shifting can typically be more easily identified given the ability to compare price differentials or the avoided cost of balancing capacity from a peaking plant or alternative source.

This will be most lucrative in markets with a high or increasing penetration of renewables. While most energy systems can deal with a proportion of variable generation up to around 20% to 40%, levels beyond this are increasingly resulting in oversupply and undersupply scenarios, requiring a different market model and a stronger transmission network. Negative pricing is already happening in certain regions around the world where renewable energy is sometimes surplus to demand, driving down wholesale prices to zero and even negative, thus forcing baseload plants to ramp down accordingly. While this is great for consumers, it’s less so for existing conventional plant owners.



With the cost of negative pricing still typically socialized among ratepayers, or high curtailment rates resulting in wasted electricity, energy providers and policymakers are coming under increasing pressure to resolve the imbalances by aligning supply with demand and thus storing excess energy generation for periods of peak demand. Such storage also enables more effective price arbitrage between peak and off-peak tariffs, albeit eroded over time as supply and demand imbalances – and therefore price differentials – are reduced.

Compensation conundrum

However, other benefits are less easy to quantify and will rely on the market determining either the avoided cost or the deemed value of a specific application: for example, T&D investment deferral, net metering, congestion relief, avoided capacity buildout and improved shutdown and maintenance management. Though typically less lucrative than bulk energy services, the value of ancillary services provided by some storage solutions should also be compensated.

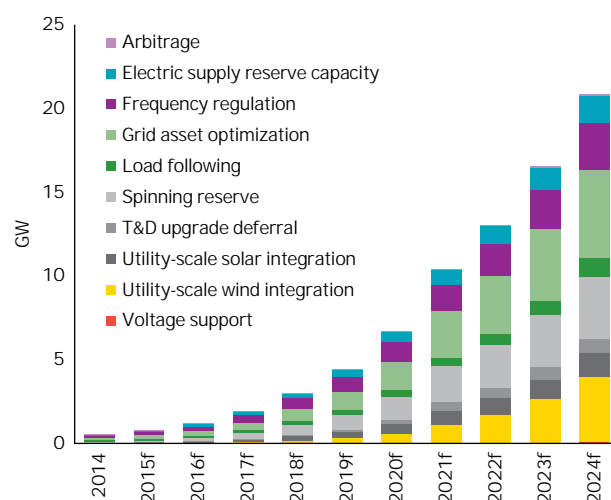
However, such price signals are often currently lacking, or the applications span different parts of the energy system, making it difficult to monetize individual benefits or isolate the stakeholder(s) accruing the benefits to the overall system.

Determining reflective compensation schemes for storage can be particularly tricky where certain stakeholders are part of the regulated market (e.g., transmission or distribution system operators) and others are part of the deregulated market (e.g., producers or end customers). As a result, the revenues generated for putting storage systems in places are not yet fully reflective of the benefits, although policy provisions are starting to address this. The US Federal Energy Regulatory Commission (FERC), for example, has made significant amendments to market rules and tariff structures after finding compensation in most ancillary markets inadequate. FERC Order 755 and 784 in particular require transmission organizations and independent system operators to adopt a capacity payment and a market-based performance payment to reward solutions providing faster ramping.

Model optimization

The availability and terms of PPAs, whether policy- or market-driven, may also determine the most relevant business model for larger-scale storage applications. For example, the demands or incentives for developers, generators or grid operators to shape generation to meet demand will influence the investment case and target market for technology providers.

Forecast installed energy storage capacity by application 2014-2024



Source: *Energy Storage for the Grid and Ancillary Services*, Navigant Research, 2014

The question of who should – and can – own and operate energy storage assets is also a critical issue in building an investment case. Distribution network operators (DNOs) are often seen as the best home for large-scale battery storage because it offers an alternative to building new substations, installing transformers or erecting new overhead lines to reinforce the grid. However, DNOs are not always keen to own storage assets themselves given their regulated and limited capital budgets, and inability to move as fast as private developers.

Policy can also impact the ability of such stakeholders to participate. For example, DNOs are typically not allowed to own storage assets in Europe, resulting in no obvious owner for an energy storage system for curtailment applications. In the UK, storage is still classified as generation, a potential sticking point for DNOs given their trading activity is limited to a maximum of 2.5% of turnover by the regulator Ofgem.

For large-scale solutions, the traditional IPP model may be more ideal, where the private sector can develop, build, own and operate the assets, assuming appropriate return on their investment. However, even here there can be challenges. Under current regulations in Germany, for example, renewable generators are paid a fee once curtailment reaches a certain level and so have reduced incentive to own storage assets directly. If on the other hand, the storage unit is charged with grid-delivered electricity, certain network and renewable levies have to be paid when charging and again when discharging.



First-mover markets

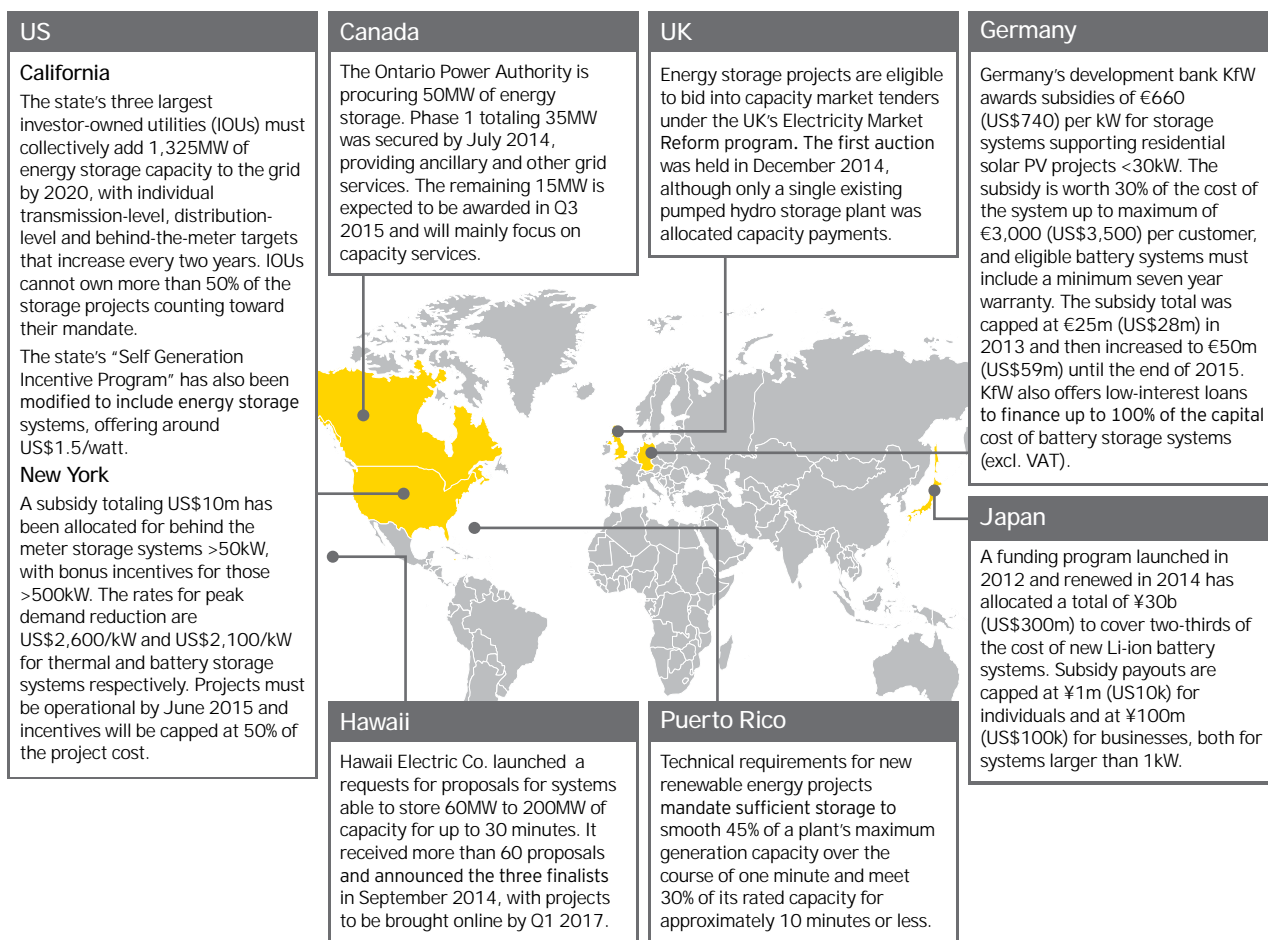
Notwithstanding the emphasis on cost reduction and policy measures that remove market distortions and encourage the most efficient allocation of resources, energy storage solutions will be, or already are, more commercially viable in markets with certain characteristics, as indicated in the graphic on page 19. The merit order of displacement will also likely determine the relative cost-competitiveness of storage depending on the opportunity cost, i.e., solar-storage hybrid solutions displacing a gas-peaking plant compared to the displacement of a diesel generator. In some parts of Australia, for example, solar solutions with Li-ion batteries are already at grid parity where remote communities or mining sites are heavily reliant on diesel generation.

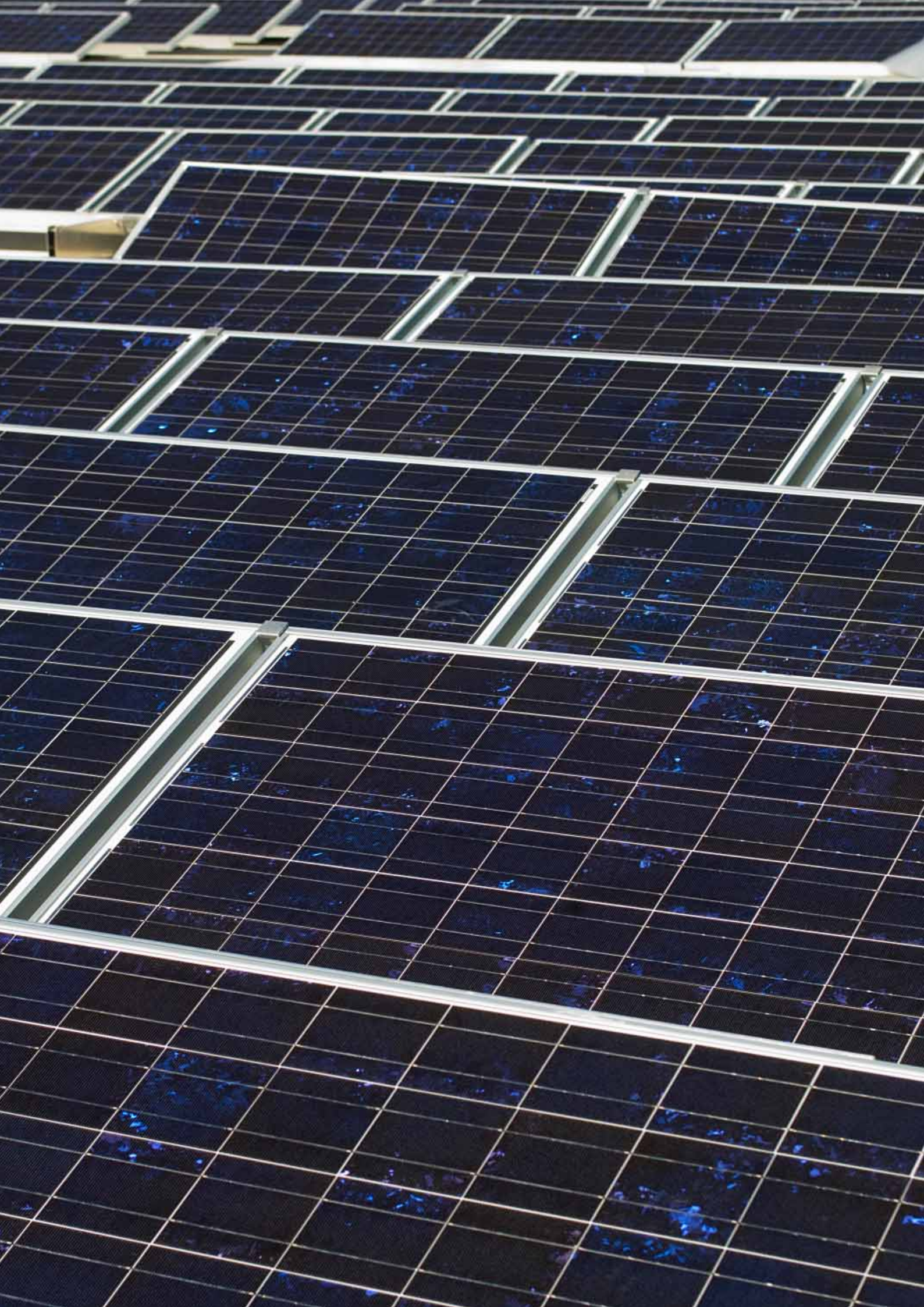
Some countries are already emerging as potentially attractive storage markets thanks to policy-based incentives (see the graphic below) or other fundamental drivers such as increasing renewable energy penetration.

Setting records

Precedent projects are also helping to put certain markets on the map. Europe's largest commercial battery plant was switched on in Germany in September 2014 by domestic utility WEMAG AG. The 5MW facility, costing €6m (US\$8m) and comprising around 26,000 Li-ion batteries, is reported to provide the same control power as a conventional 50MW turbine. Unveiled in the same month, the 8MW Tehachapi project in California is currently North America's largest

Key policy measures in selected markets





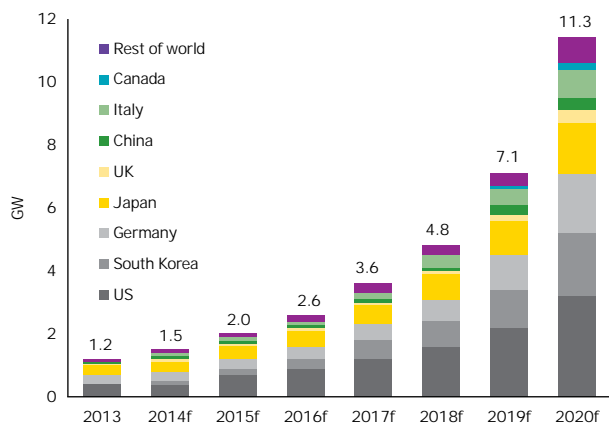


battery facility and is part of a US\$54m two-year test project to collect power generated by 5,000 turbines using more than 600,000 Li-ion battery cells.

However, Asia has already set the bar high, with the 2011 Zhangbei National Energy Storage and Transmission Demonstration Project, the world's first to integrate utility-scale wind and solar capacity (totaling 140MW) with BYD's large-scale 20MW to 36MW Li-ion battery systems. Japan's NGK also has more than 200MW of sodium-sulfur batteries installed worldwide, including a 34MW storage plant integrated with the 51MW Rokkasho-Futamata wind farm. Hot on its heels, Tohoku Electric Power Co.'s 40MW pilot project in Sendai, Japan, will be the largest of its kind when complete this year.

However, it is unlikely to hold the record for long. November 2014, saw AES Energy Storage selected to build a 100MW system under Southern California Edison's 250MW storage procurement program, adding to AES's 200MW+ of capacity already in operation, construction or late-stage development and establishing it as the US's largest grid-scale energy storage provider.

Forecast cumulative installed energy storage capacity by country



Source: Bloomberg New Energy Finance/EY proprietary data

Breaking down the breakthrough

The academic case for energy storage is robust and the commercial case is improving. Increased grid interconnection will always be an option to reduce curtailment in the case of over-supply of renewable energy; however, from a consumer perspective, the ability to separate supply and demand and the increased energy security that storage can bring, is likely to compensate for this.

Market forecasts are also encouraging. Lux Research projects a US\$10.5b grid storage market by 2017, up from just US\$200m in 2012, while in capacity terms, BNEF estimates that total installed energy storage capacity will reach 11.3GW by 2020, a tenfold increase on 2013 levels. Looking further ahead, the Boston Consulting Group forecasts a cumulative global energy storage market of US\$370b by 2030.

However, the investment case for storage can also be complex given the numerous technologies, applications, customers and market drivers. The costs and benefits therefore need to be better understood, development and operating risks mitigated, new business models explored, regulatory frameworks developed and market distortions reduced, such that ownership and revenue streams can be more easily identified, procured, traded and priced by the market. The cost-competitiveness of storage relative to other flexible system options such as energy efficiency, demand response, transmission expansion, grid connectivity and capacity markets will always need to be considered.

Viewing storage as just another energy asset that generates long-term predictable revenues and needs competitive and appropriate construction capital solutions is key. The fact that storage can provide incremental revenue streams for multiple stakeholders is an added benefit.

In short, with a number of storage technologies already proven and costs falling fast, we must stop thinking about storage as something that will arrive tomorrow. It arrived yesterday, the game is already changing and investors need to ask themselves, how they can use the technology to secure the necessary returns in the future.

To find out how EY can support your energy storage transactions, please contact:

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Germany



Highlights

- Early 2015 saw Germany hold its first solar auction, paving the way for future tenders covering a range of technologies.
- Critics claim the total solar capacity being tendered is insufficient to reach the country's 2020 targets.
- The first offshore tenders could be held as early as September 2016, with the sector regaining momentum thanks to legislation passed in 2014.
- A proposed levy on fossil fuel plants to spur emissions reduction efforts has attracted significant criticism.
- Increased local powers to test underground transmission cables could overcome grid expansion challenges.

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Setting a precedent. The first half of 2015 witnessed the first phase of one of the potentially most fundamental shifts under Germany's Renewable Energy Act (EEG) to date, namely a transition from FITs to tenders. April's debut auction for ground-based solar projects less than 10MW represents the first of a series of pilot tenders between 2015 and 2017 that could pave the way for future auctions covering other technologies if successful.

Mixed results. While some have hailed April's auction a success, attracting 170 bids totaling around 700MW for the 150MW of capacity on offer, the results are arguably also a bit mixed. While the average price of €91.7/MWh (US\$100.9) was significantly below the ceiling price of €112.9/MWh (US\$124.2), it was still higher than the FIT developers can currently secure for ground-based PV arrays up to 10MW, failing to support the Government's claim that tenders would lead to lower electricity prices.

Falling short. The German Solar Industry Association (BSW-Solar) and others also claim that the 1.2GW of solar capacity to be tendered over the next three years is insufficient to reach the EEG targets. The April tender is to be followed by a 150MW auction in August, a 200MW tender in December, and then 400MW and 300MW allocations in 2016 and 2017 respectively. However, this follows a somewhat sluggish 2014, where, after several years of falling support, additions of 1.9GW were far below the Government's 2.4GW to 2.6GW annual target corridor. The slower expansion has already prompted a reduction in the monthly FIT degeneration rate to 0.25% for the period April 2015 to June 2015. It is arguably therefore too early to assess whether April's auction can be called a success and whether it was able to support the participation of a range of players, with the exact details of the winning bids yet to be disclosed.

Getting squeezed. However, some in the market, including the Germany Wind Energy Association (BWE), are fearful that the tenders will limit participation to large utilities and investors, squeezing out the smaller players and community-based investors that have historically been the foundation of investment in Germany's

Rankings snapshot	Issue 44	Issue 43
Total RECAI	3	3
Onshore wind	3	3
Offshore wind	3	3
Solar PV	5	4
Solar CSP	27*	27*
Biomass	8	8
Geothermal	8	8
Hydro	10	10
Marine	27	27

As a barometer for Europe's renewables market, all eyes will be on Germany in the year ahead.

renewables market, given many won't have the financial strength to compete effectively. Although a timetable for potential onshore wind auctions has not yet been announced, BWE is already intensifying its opposition in anticipation of increased bureaucracy and the unclear role of repowering in future auctions. Particularly given the Government's own projections that new onshore wind installations will fall between 2017 and 2019, and then be increasingly based on repowering.

Offshore optimism. The offshore wind sector has been given a little more clarity, however, with the first tenders planned as early as September 2016. While many German offshore projects have suffered significant delays and cost overruns in recent years, there is optimism that new legislation introduced in 2014 addressing grid connection and liability issues should alleviate some of the problems, with the industry expecting as many as five financial closes in 2015. With just over 1GW of grid-connected offshore capacity at the end of 2014, that figure is expected to increase to 3GW in 2015.

Further, while offshore wind ambitions have been lowered to 6.5GW by 2020 and 15GW by 2030, down from 10GW and 25GW respectively, the likelihood of these revised targets being achieved is much higher, boosting confidence in the sector. The consensus among lenders, for example, is that pricing for offshore projects, previously around 265bps + Euribor, will move toward mid-200bps + Euribor margins and below through 2015.

Studying lessons learned. Similarly, while a recent study of eight German offshore wind farms by the Hertie School of Governance reveals average cost overruns of 20% and time delays of 13 months per project, it also concludes these are lower than might be expected for some projects given historical grid issues, and that such risks will become more manageable as the industry matures.

Revoke risk. However, while most offshore participants have been dealing relatively comfortably with the recent switch from a voluntary to mandatory direct selling system based on premiums rather than FITs, there are some concerns over a further switch to a tendering system. The main issue is uncertainty over whether the Government could revoke licenses already granted to 40 projects representing around 12GW of capacity at various stages of development, in order to tender out the areas under the new regime.

Heavy levy. Notwithstanding the rationale for the shift toward a tendering system currently being piloted and the introduction of caps on new wind and solar additions – largely an attempt to lower electricity prices – there is speculation that the EEG reforms potentially endanger Germany's ability to achieve its 2020 targets, including reducing emissions by 40% on 1990 levels. This prompted Energy Minister Sigmar Gabriel to propose earlier this year a climate levy on old fossil fuel-fired power plants to reduce CO2 levels by an additional 22 million tonnes, triggering penalty payments on plants that generate emissions above a certain threshold.

Watering down. However, the proposal has sparked significant opposition from utilities, trade unions and even Chancellor Merkel's own Christian Democratic Union party. As a result, Gabriel has watered down the proposal to an additional 16 million tonnes of CO2, though this continues to attract criticism. In a departure from the original proposal, it is also now envisaged that the climate levy will be linked to the electricity price and indexed to the European emissions trading system.

Going under. Gabriel enjoyed greater policy support in March, however, when the cabinet approved measures to give local authorities more options to test underground transmission cables, and enable greater community participation in grid planning processes. While the Government has long championed new transmission highways to transport power from strong wind sites in the north to high demand centers in the south, such grid expansions have attracted opposition in some states. The new legislation should help catalyze alternative transmission solutions.

Center of attention. Germany has long enjoyed the status of being Europe's renewable energy powerhouse, boasting consistent growth and stable policy regimes, even in the midst of major legislative changes. As a result, renewable energy now represents around 28% of the country's total electricity. However, the success of the EEG amendments in simultaneously driving down consumer electricity prices and meeting the country's 2020 targets now looks less certain, while fault lines are also starting to appear within the coalition government. As a barometer for Europe's renewables market, all eyes will therefore be on Germany in the year ahead.



UK



Highlights

- The Conservative Party election victory brings some political stability but also contradictions between energy policy rhetoric and actions.
- The Government appears to be favoring more expensive energy sources, such as nuclear, over more cost-effective renewable sources such as onshore wind and solar PV, despite market signals.
- The withdrawal of two of five solar projects from the first CfD tender round indicates prematurely accelerating competition could hinder sustainable cost reductions.
- A proposed EU referendum is fueling further uncertainty over future UK energy policy.

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The sharp edge. The Conservative Party surprise victory in May's election is something of a double-edged sword for the energy sector. Pre-election policy uncertainty is now gone and the end of a coalition government should mean less political wrangling and greater expediency in the legislative process. Utilities are also likely to be relieved to escape the potentially more draconian energy market reforms proposed by the opposing Labour Party, including price freezes and tighter regulation. However, the Conservatives' manifesto is also painful reading for the renewables sector, no longer able to rely on the challenge posed by the Liberal Democrats to add a splash of green to the Government's energy agenda.

A bad day. The Government's pledge to scrap all subsidies for new onshore wind projects and devolve decision-making powers on planning applications to local authorities has left the wind sector perplexed, and cast a shadow over the estimated 7GW of projects in the pipeline. Meanwhile, the complete omission of solar from the Conservative's manifesto has left this previously burgeoning market with little visibility on whether it will have a starring role in the UK's future energy mix, or be nothing more than a footnote, despite experiencing record growth in 2014, as installations increased 79% to almost 5GW.

Not picking winners. The frustration of both sectors arguably stems from a fundamental inconsistency between the Government's rhetoric and its actions. Despite championing a liberalized and market-driven energy sector, generation mix technology choices are clearly being made, though apparently ignoring market signals that onshore wind and solar PV can deliver affordable and dispatchable energy.

Rankings snapshot	Issue 44	Issue 43
Total RECAI	8	8
Onshore wind	11	8
Offshore wind	1	1
Solar PV	13	10
Solar CSP	27*	27*
Biomass	5	5
Geothermal	19	19
Hydro	24	24
Marine	2	2

The election outcome offers the Government a unique window of opportunity to reconcile its contradictory energy objectives.

Market signals. This is even more confusing given strong evidence that costs have further to fall. A recent report from the UK's Onshore Wind Cost Reduction Taskforce, backed by major industry players, estimates an average reduction of 22% on today's costs if certain recommendations around consenting processes and grid connection are implemented, taking onshore wind costs below those of combined-cycle gas generation.

Contradictions. Quickly becoming one of the country's cheapest sources of energy, the Government's intention to withdraw support for onshore wind therefore contradicts its pledge to reduce emissions at least cost. Energy prices could actually be pushed up as more expensive sources, such as offshore wind, are used to fill the capacity gap as onshore wind projects fall away. The manifesto justification that "onshore windfarms often fail to win public support" is also at odds with the Government's own recent surveys showing support at 68% (and 74% for offshore wind). On the flip side, surveys by the Department of Energy & Climate Change (DECC) have repeatedly shown that the public generally oppose fracking and nuclear power, two of the Government's big energy bets.

CfD distortions. Even the Electricity Market Reform (EMR) Contracts for Difference (CfD) auction process appears to be increasingly turning into a quasi-public/private partnership. Again, contrary to a market-based approach in being overly prescriptive on technology categories and allocating a budget that many believe is too weak to support sufficient capacity to achieve genuine market-driven energy security. The Government appears to be backing more expensive projects while prematurely accelerating competition for cheaper sources in a way that risks making projects unviable or fails to achieve sustainable market-based cost reductions.

Bidding goodbye. In February's debut CfD round, for example, solar PV was awarded just 72MW of the 2GW of capacity contracted, with 1.2GW and 749MW going to offshore and onshore wind respectively. However, two of the five solar projects have since withdrawn from the CfD register, deemed to be undeliverable at the awarded strike price of £50/MWh (US\$77), being close to the retail spot price of around £44/MWh (US\$68). This could spur calls for a bid bond mechanism to mitigate the risk of developers bidding too low and then dropping out, though regardless, means that few new large-scale solar projects will be brought online in the UK until after 2016.

Small is beautiful. The Government does, however, seem to advocate smaller-scale solar projects (increasing the permitted development threshold for commercial rooftop solar panels installations from 50kW to 1MW) and community-based schemes. These sub-sectors have merit, but the shift of focus away from large-scale renewables raises questions about this Government's view on the real role renewables has to play in the UK energy mix.

Climate change champion. It's not all doom and gloom, however. The Government has reaffirmed its commitment to the Climate Change Act and a strong global pact in Paris this December. Many have also hailed the appointment of Amber Rudd as Secretary of State for Energy and Climate Change to be a positive sign given she has historically championed a low-carbon economy and supported rooftop solar. However, both Rudd and newly appointed DECC Minister Andrea Leadsom have also been vocal in their opposition to onshore wind farms. Further, the Government is continuing to show fierce opposition to setting a 2030 decarbonization target, which many claim would provide the sector with the long-term certainty it requires to spur investment.

EU uncertainty The new Government's pledge to hold a referendum on UK membership of the EU within the next two years has also prompted some nervousness around long-term investment and could see energy companies developing contingency plans in the event of an "out" vote. Saying that, few in the market seem to foresee appetite to undo the current EMR program, one of the Government's flagship policies.

So where now? What is clear is that the Conservatives won't be winning the award for "greenest government ever" any time soon. However, this election outcome should provide some much-needed political stability, and offers the Government a unique window of opportunity to reconcile its somewhat contradictory energy objectives, assess the questionable success of the EMR and address the conflict between its liberalized market rhetoric and policy that is clearly picking winners and losers regardless of market signals. Only time will tell whether it seizes that opportunity, and realizes that simultaneously chasing a climate change target while abandoning the most cost-competitive renewable energy technologies is somewhat absurd.



Egypt



Highlights

- Tender of 4.3GW of wind and solar capacity attracts more than 180 bidders.
- The Government is being pragmatic in relaxing the threshold for capacity per bidder.
- Currency risk and land allocation are prompting some concerns over project bankability.
- Outside of the tender process, the Government has signed more than 9GW of wind and solar deals with international consortia.
- Bids are finally called for the much-awaited 250MW West Gulf of Suez wind project.
- The Government has initiated energy market unbundling to increase competition.

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In the news. Since launching its FIT program in September 2014 and announcing plans to procure 4.3GW of wind and solar power by 2017 as the first step to securing 20% of the country's energy from renewable sources, Egypt has barely been out of the headlines. While there are still challenges to be overcome, few can deny that the Government has sent a very clear signal to the market of its commitment to transform Egypt's energy market – and the market has responded in kind.

Out to tender. More than 180 companies and consortia responded to the Government's call for tenders in late 2014, with 110 qualifying bidders announced in January this year. These comprise 69 bidders with solar PV projects above 20MW, 13 for PV less than 20MW and 28 bidders for wind projects. With 2.3GW of solar capacity on offer, 2GW of which was allocated to larger-scale projects between 500kW and 50MW, and the remaining 300MW for rooftop solar projects less than 500kW, the volume of bids represented significant oversubscription. Meanwhile, qualifying bids for wind projects fell 20% short of the 2GW of capacity on offer, with the Government floating the possibility of re-opening the tender for a second round with the same tariff of US\$0.12/kWh on a sliding scale.

Relaxing the rules. However, this capacity gap, and the expectation that some projects will drop out of the process, has already prompted the Government to be more flexible on the 50MW cap for individual developers, formally increasing the threshold to 100MW per substation in guidance released in April. Since there will be four separate solar project substations and five separate wind project substations, this means a single qualified developer could theoretically hold up to 400MW and 500MW worth of solar and wind projects in the program respectively. Although the guidelines state each individual project is to remain capped at 50MW, a memorandum of understanding signed in late April between UAE-based Access Power and Egypt's Ministry of Electricity and Renewable Energy (MERE) to develop a 65MW PV project suggests this may have also been relaxed.

Rankings snapshot	Issue 44	Issue 43
Total RECAI	37	39
Onshore wind	33	35
Offshore wind	36	36
Solar PV	34	36
Solar CSP	12	13
Biomass	40	40
Geothermal	35*	35*
Hydro	36	37
Marine	31*	31*

The FIT regime, a structured tender process and specific goals, all demonstrate a strong political commitment to renewable energy.

Setting requirements. Regulations published in March also relaxed the capital requirement for the incorporation of special purpose vehicles (SPVs) to an initial 10% of the total, being a prerequisite for bidders to sign a land “usufruct” agreement with MERE’s New & Renewable Energy Authority (NREA), though few have yet reached the land allocation stage. But, as per the original guidance, each prequalified consortium is required to hold at least 51% of the equity of the project for at least two years following commercial operations, while the lead consortium member – who must be a local company – will be required to hold at least 25% of the project equity for that period.

Currency challenges. Some prospective developers are reportedly still struggling to secure the necessary funds, in part due to currency risk prompting PPA bankability concerns. FITs are set in dollars but paid in Egyptian pounds, with only 15% convertible at a fixed government-guaranteed rate of EGP7.15 to the US dollar and the remainder subject to the prevailing market rate. Other issues include potentially more complex JV negotiations, given the rules generally do not allow projects to be sold or transferred entirely, and land availability. Allocations of land are to be made on a first-come, first-served basis, with the top ranked project sites to be awarded to the first bidders to conclude project documents.

Beyond the auction. However, Egypt’s rapidly growing project pipeline goes beyond the capacity awarded under the FIT and auction regime. At the Egypt Economic Development Conference in March, the Egyptian Electricity Holding Company (EEHC) inked major wind and solar deals with four major consortia representing more than 9GW of new capacity. An agreement to develop 3GW of solar was made with Canadian group SkyPower, and a further 2GW with Bahrain-based Terra Sola, which also committed to construct a 200MW module factory. On the wind side, Germany’s Siemens signed a binding agreement to build 2GW of capacity and a new wind rotor blade factory, while a consortium including Saudi developer ACWA Power and Abu Dhabi’s Masdar, committed to develop 500MW of wind power and 1.5GW of solar.

Long time coming. Meanwhile in April, NERA finally welcomed bids for the 250MW West Gulf of Suez wind farm from four international consortia, six years after initial expressions of interest were called. The process was pushed back several times, mainly due to the unrest in the country during the Arab Spring. Notwithstanding the long-drawn-out tendering process, a relatively swift preferred bidder announcement is expected, potentially by the end of June. This will represent the third major wind project to be progressed in 2015, following February’s contract awards to Spain’s Gamesa for two plants in the Gabal el-Zeit area with capacity of 220MW and 120MW.

Market unbundling. Reforms to liberalize the energy sector more broadly are also underway and send strong signals of the Government’s desire to create a more competitive and transparent market. In February, Egypt’s cabinet approved legislation separating production, distribution and transmission activities, and limiting the state’s role to regulating and monitoring the electricity sector as opposed to managing it directly. This follows steps taken to address the country’s budgetary imbalance through the gradual liberalization of electricity prices, with the Government slashing energy and electricity subsidies in mid-2014.

Stacking the columns. Despite a lengthy period of political turmoil only just behind it, Egypt has rapidly emerged to become one of the most promising renewable energy markets in the MENA region. While some social unrest remains, the military rule re-established in 2013 and signs of economic recovery are creating a reasonable degree of stability in the country. At the same time, the introduction of the FIT regime, a structured tender process and specific goals, demonstrate a strong political commitment to renewable energy as a means of meeting the country’s surging energy demand. Unbundling efforts also signal a broader long-term commitment to a competitive energy market. Combine this with exceptional wind and solar resources, and the media coverage dedicated to Egypt’s energy transformation suddenly doesn’t seem so surprising.

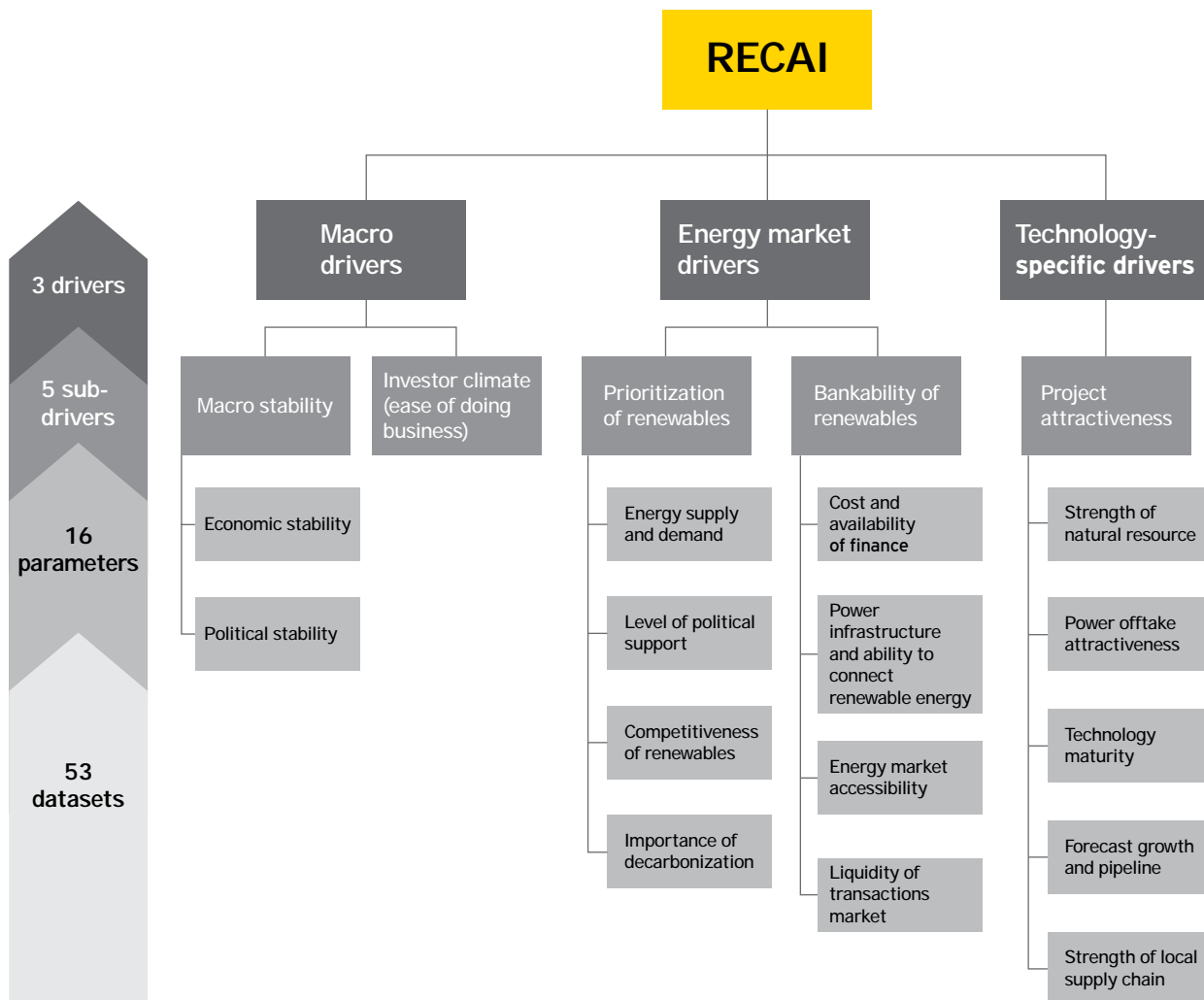
Glossary

Abbreviation	Definition
b	Billion
BNEF	Bloomberg New Energy Finance
CfD	Contract for difference
CSP	Concentrated solar power
DECC	Department of Energy & Climate Change (UK)
DEWA	Dubai Electricity and Water Authority
DNO	Distribution network operator
EBRD	European Bank for Reconstruction and Development
EEG	Renewable Energy Act (Germany)
EMR	Electricity Market Reform (UK)
EU	European Union
FDI	Foreign direct investment
FERC	Federal Energy Regulatory Commission
GW	Gigawatt
IPP	Independent power producer
JV	Joint venture
kWh	Kilowatt hour
LED	Light-emitting diode
Li-ion	Lithium-ion
m	Million
MASEN	Moroccan Agency for Solar Energy
MENA	Middle East and North Africa
MERE	Ministry of Electricity and Renewable Energy (Egypt)
MW	Megawatt
MWh	Megawatt hour
NREA	New & Renewable Energy Authority (Egypt)
PPA	Power purchase agreement
PTC	Production tax credit
PV	Photovoltaic
R&D	Research and development
RET	Renewable energy target (Australia)
RPS	Renewable portfolio standard
SGF	Strategic Growth Forum
t	Trillion
T&D	Transmission and distribution
TSO	Transmission service operator



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 14 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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Recent EY publications

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(2015)



Commissioned by the European Wind Energy Association, this EY report explores why offshore wind energy represents a crucial component of the future European energy system and the actions required to realize its potential. Available at www.ewea.org.

Utilities Unbundled

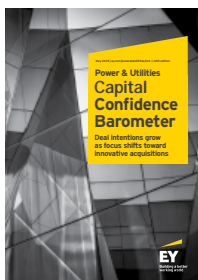
(2015)



Utilities Unbundled, our biannual global power and utilities magazine, provides new perspectives on the sector, insight from leading industry figures and analysis of the latest trends. The February 2014 issue explores capacity markets as a solution to Europe's unique solar and wind grid challenges, Germany's quest for smart networks and why coal trading remains critical to meet growing Asia-Pacific energy demand.

Power & Utilities Capital Confidence Barometer

(2015)



Our 12th Global *Capital Confidence Barometer* finds the global M&A market maintaining the positive momentum that developed during 2014. This issue explores how innovation, complexity and disruption are defining the new M&A market.

The Cleantech Growth Journey: CEO Retreat

(2014)



Summarized in this report are the insights and takeaways from the third annual EY *Cleantech Growth Journey: CEO Retreat*, which focused on the critical issues of capital, transactions, corporate partnering and global expansion.

Power transactions and trends Q1 2015

(2015)



This edition of *Power transactions and trends* for 2015 reports on the first quarter of what looks set to be another robust year for M&A within the power and utilities sector.

From boiler room to boardroom: optimizing the corporate energy mix

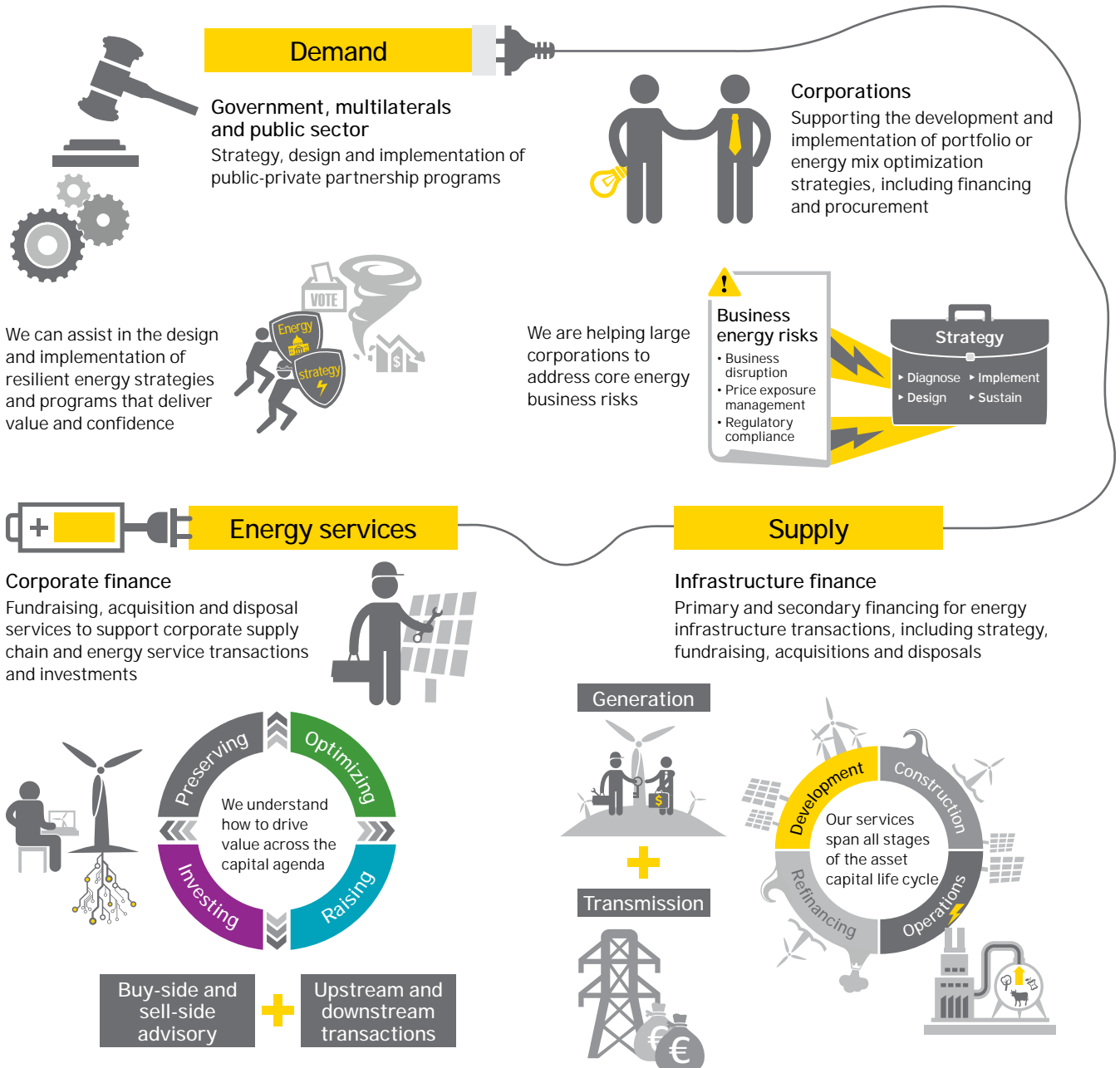
(2013)



Conventional renewable energy procurement instruments are rarely fit for purpose. Corporations are challenged with moving beyond conventional thinking to include renewable energy as part of a more diversified energy strategy. This report examines the range of innovative strategies at their disposal.

What we do

Our integrated policy, finance and transaction services span the whole energy life cycle and operate across multiple technologies and geographies, supported by our global network of energy professionals, our global investor relationships and our global project experience.



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