In fact, the principal purpose of this edition is to update all our readers on the exciting plans we have in place to update and refresh the RECAI.

It won't be a surprise to anyone reading this that the renewables sector continues to evolve rapidly, and as such the global industry is probably at its most important point in evolution as it begins to operate in an increasingly subsidy-free environment.

Many commentators have talked about the decline of government support as being the beginning of the end. We have long talked about the need for the sector to wean itself off the drug of subsidies, and it now appears to be doing just that, like it or not.

So as renewables face exciting new horizons, no longer constrained by government policy but facing more intense competitive pressures, it is only right to reflect this brave new world in a revamped and refreshed RECAI, the first edition of which will be published in April this year.

Until then, I hope you enjoy this interim publication, in which we have explored some of the opportunities and challenges resulting from this changing energy landscape, as well as how we think specific markets are faring following another year of record clean energy investment.

The fact that the clean energy market continued to defy economic weaknesses in some markets, the collapse of commodity and oil prices and a strengthening of the US dollar against other currencies to still rack up a record US$329b of new investment in 2015 is testimony to the increasingly compelling economic case for an energy market that is redefining the boundaries of how we generate, store and consume energy.

As such, it looks like 2016 will be a year of reckoning for the global power market on many levels ... watch this space!
2015 at a glance ...

**Top 15 markets ($b)**
- China 110.5
- US 56.0
- Japan 43.6
- UK 23.4
- India 10.9
- Germany 10.6
- Brazil 7.5
- South Africa 4.5
- Mexico 4.2
- Canada 4.0
- France 2.9
- Australia 2.9
- South Korea 2.5
- Morocco 2.0
- Italy 1.5

**Other**
- Europe 20.1
- Asia-Pacific 9.1
- MEA 6.9
- Americas 5.9

**New wind and solar capacity installed in 2015 by region**
- **North America**
  - Total wind 8.9GW (6%)
  - Total solar 12.1GW (57%)
- **Central/South America**
  - Total wind 1.7GW (78%)
  - Total solar 4.2GW (10%)
- **Europe**
  - Total wind 8.3GW (10%)
  - Total solar 15.1GW (133%)
- **Asia-Pacific**
  - Total wind 36.0GW (33%)
  - Total solar 31.5GW (129%)
- **Middle East and Africa**
  - Total wind 1.8GW (13%)
  - Total solar 1.0GW (10%)

**Wind and solar represented around 50% of all new generating capacity added in 2015 (including conventional power)**

**New 2015 GW**
- Utility PV 33.0
- Commercial PV 15.2
- Residential PV 8.3
- CSP 0.3
- Total solar 56.8
- Onshore 59.5
- Offshore 4.4
- Total wind 63.9

**$329b new clean energy investment**

**$161b in smart, digital and storage technologies**

**$41.8b labeled green bonds issued**

437 major multinationals are now applying internal carbon pricing +30% on 2014 (plus additional 583+ to incorporate within two years)

$41b in wind and solar capacity (including $67b in small distributed capacity)

Wind and solar represented around 50% of all new generating capacity added in 2015 (including conventional power)
**Key developments**

**Country-specific highlights**

**Hot**

**US five-year boost.** In a move that surprised even the most optimistic US renewable energy advocates, late 2015 saw Congress approve a five-year extension of the wind production tax credit (PTC) and solar investment tax credit (ITC), providing some much-needed respite from the boom-bust uncertainty of the past decade. The US$23/MWh PTC, which expired in December 2014, is to be extended retroactively to the end of 2020, reduced by 20% annually between 2017 and 2019, then phased out completely. The ITC, worth 30% of the upfront cost of solar installations and previously scheduled to reduce to 10% after 2016, will remain at 30% for three years and then fall to 26% in 2020, 22% in 2021 and 10% in 2022 before being phased out completely.

**Mexico gets into the details.** The passing of the much-awaited Energy Transition Law in December 2015 has provided greater clarity around how Mexico plans to meet its ambitious target of 35% clean energy by 2024, equivalent to around 28GW. Clean energy auctions will be a primary driver, with the first of these to be held in April 2016 and allocating as much as 3GW. The law also details how the new clean energy certificate program will operate when it begins in 2018, requiring electricity distribution companies, fossil-fuel generators and “qualified consumers” to buy 5% of their supply from clean-energy sources. Meanwhile, the start of wholesale electricity trading in the Baja California region in January marked the opening of the country’s first competitive power market.

**South Africa doubles tax rebate.** After last year committing to expand its large-scale renewable energy procurement program by a further 6.9GW through to 2020, South Africa is also now looking to incentivize commercial power consumers to use energy-saving technologies or distributed generation in order to ease pressure on the already stretched state-run utility Eskom. It has increased the tax rebate from ZAR45/MWh (US$27) to ZAR95/MWh (US$56) for energy saved, or self-generated, applied retroactively from 1 March 2015.

**Brazil weathers the storm.** Despite reportedly heading for its worst recession in decades, energy remains a top government priority in Brazil. The 10-year energy plan approved in late December 2015 estimates US$351bn of investment will flow into the sector through 2024 and sets out clear goals to more than triple wind capacity to 11.6% and increase solar from almost zero to 3.7% in the same period. A recent legal amendment permits plants that commenced operations later in 2015 but were unable to sell all their capacity at previous auctions to participate in the upcoming 31 March A5 power auction, which has attracted 48GW of applications, while the launch of the Distributed Energy Generation Program in late 2015 now allows businesses generating between 1MW and 5MW of solar power to sell to distributors via electronic auctions.

**Australia warms up.** After almost two years slipping down the RECAI rankings, there are signs Australia is finally warming up again. December 2015 saw the Government cancel a previous directive prohibiting the Clean Energy Finance Corp A$10bn (US$7.2bn) fund from investing in new wind projects, representing another row back of the anti-renewables stand of Tony Abbott, who was ousted by Malcolm Turnbull as leader of the ruling Liberal Party in September 2015. The Environment Ministry has also since taken control of key renewable energy agencies that Abbott wanted to abolish and has reinforced the need for investment to help double large-scale renewable energy between 2015 and 2020, in addition to indicating ambitions to develop significant offshore wind capacity.

**Markets to watch.** While COP21 put the ambitions of 195 markets in the spotlight, 2016 is expected to see the emergence of some new green giants. Argentina, which boasts some of the best wind and solar resource on the planet, plans to raise its renewables mix from less than 2% to 20% over the next decade under new pro-market President Mauricio Macri, elected in December 2015. The lifting of economic trade sanctions in Iran is also expected to open up major energy investment opportunities, with as much as 5.6GW of non-hydro renewable power capacity forecast by 2020. Meanwhile, Iran has published a three-year roadmap targeting 3.5GW of wind capacity, and Bangladesh is targeting 2GW of renewables capacity by 2021, an almost five-fold increase.
Deal, investment and policy highlights

**Merger speculation to reshape wind market.** The philosophy that scale is the best way to sustain market share looks set to continue driving continued M&A and consolidation activity in the year ahead, with speculation soaring around a potential deal between Gamesa and Siemens that could create the world’s largest turbine maker. While a deal is yet to be announced, Spain’s Gamesa has confirmed that it is holding conversations over a potential integration with some of Siemens’ wind businesses via a merger structure. Any such deal would follow similar exercises in 2015 involving GE and Alstom, and Nordex and Acciona. A Siemens-Gamesa deal would represent around 15% of the global wind market, exceeding the 10% and 11% shares currently held by Vestas and GE, respectively, according to BNEF. It would also give Siemens an improved position in key growth markets such as India, China and South America, as well as the opportunity to expand the proportion of its revenue from service contracts. Meanwhile, Gamesa would gain greater access to commercially viable 3MW+ turbines required to compete effectively in site-constrained or offshore wind markets, as well as Siemens’s strong industrial and commercial presence across South America region as an electrical equipment supplier. Siemens is also reportedly holding talks over buying Iberdrola SA’s 20% stake in Gamesa.

**SunEdison U-turn.** As competition across the global energy market intensifies, however, companies looking for rapid growth or expansion may want to first take stock of the challenges now facing SunEdison, historically the poster child for ambition as it sought to become the world’s largest clean power developer. The new year has seen the company effectively reverse part of a major pipeline acquisition made last year, handing back four US solar projects representing more than 1GW of capacity in exchange for wiping out exchange notes held by the three original owners, plus 12.2 million share in its yieldco TerraForm Power. The move is part of SunEdison’s efforts to reassure investors over liquidity in the face of US$12b of debt and several years without profit. The company is also renegotiating its US$2.2b deal to acquire Vivant Solar as an entry point into the rooftop solar market, exiting some markets such as the UK, and lining up “warehouse” financing facilities and strategic partnerships with institutional investors as exit routes for some projects until its two ailing yieldcos recover. There is still a relative degree of optimism that SunEdison will continue to be a successful pillar of the global renewables market, but 2016 will inevitably redefine its priorities and goals.

**Solar security.** Appetite for raising capital via solar asset-backed securities appears to be gaining traction outside the US market, with Africa’s off-grid solar industry being turned into an asset class for the first time. Dutch investor Oikocredit International, New York-based merchant bank Persistent Energy Capital LLC and London-based developer BBOX Ltd raised US$500,000 in this first issue by bundling 2,500 active rooftop solar contracts in rural Kenya, with an interest rate of 2% and an average maturity of 2.5 years. They are also working in Rwanda, with plans to expand to Pakistan and Nigeria shortly and secure six million customers in at least 10 countries over the next five years, requiring financing of up to US$2b. In China, meanwhile, solar-asset backed securities also fall in line with government efforts to encourage PV companies to seek debt financing rather than risk the volatility of the stock markets. In January, Shenzhen Energy Nanjing Energy Holding raised CNY1b (US$152m) in China’s first such issue, with the company paying 3.6% to 4.5% per annum for the securities, backed by earning from solar power generated by its projects.

![New clean energy investment worldwide, 2015](image-url)
The unrelenting march toward cost-effective subsidy-free energy is putting ever greater pressure on utilities, challenger businesses and investors to redefine how we generate and consume energy in the years ahead.

Since 2008, the World Energy Council has been tracking progress against the global “energy trilemma” – the need to balance energy security, affordability and environmental sustainability. As we emerge from the warmest year in recorded history and digest the extraordinary outcome of December’s COP21 Summit, which saw emissions reduction commitments from 196 countries and triggered a plethora of clean energy pledges by corporations, financial institutions and even philanthropists, never before has solving this issue been higher on political, boardroom and investment committee agendas.

Yet at the same time, never before have the opportunities been so vast, with the transition to a world of subsidy-free renewables creating new horizons for innovation, economies of scale and value chain integration, as well as opening up new markets globally. Morocco, Chile, Brazil and India are just some of the countries now delivering record low unsubsidized wind and solar tariffs that out-compete their fossil fuel equivalents.

However, the new horizons created by the heightened sense of urgency to address the global energy imperative and accelerate the deployment of subsidy-free energy also brings with it more intense competitive pressure, with the spotlight shifting from what needs to be solved – on which there now seems to be global agreement – to who will solve it and how.

In other words, how can the world’s utilities, challenger businesses and investors come together in an increasingly dynamic and competitive environment to deliver the world with secure, affordable and low-carbon energy, while also taking advantage of these new horizons?

• How do utilities, historically the cornerstone of the global energy industry, save themselves from the precipice of oblivion? With the time for tweaking operational efficiencies over, the choice is much starker: reinvent or rest in peace.

• How do the “challenger businesses” – the technology innovators, project developers, independent power producers and energy service providers – who have so far thrived in stealth mode filling the gaps left by utilities, continue to succeed in the face of increasing competition from new entrants and utilities trying to retain market share or seeking reinvention?

• How do investors, more eager than ever for a seat at the energy table and with the most competitive cost of capital, get access to the cash flows that utilities and challenger businesses are creating, while meeting their double bottom line remit of long-term returns and sustainability?
The utility barometer

There is no escaping the fact that incumbent utilities – whether through sheer scale or legacy market presence – hold a large proportion of the world’s power assets, represent a significant proportion of mainstream investor holdings and have the influence to drive consumer behavior. As such, their success or failure to reinvent and become survivors, and even leaders, of the global energy transformation, rather than its unfortunate victims, will have a significant impact on the challenge and opportunities for investors with deeper pockets and cheaper funds, and competitors that can provide utility customers with alternative solutions.

This survival hinges on an honest examination of the issues facing many of today’s utilities: falling revenues and margins due to spiraling customer churn and reduced energy demand, failure to provide the right products and services, lack of visibility beyond their own borders, regulatory restrictions, and the inefficient use of capital. It can be argued that many utilities have in recent years been guilty of putting too much faith in the status quo, relying on regulatory barriers to energy to project existing earnings.

Competitive tension

Meanwhile, challenger businesses, who have been flexible enough to step in opportunistically, are also now increasingly challenging the utility model head on as integrated energy service providers. Utilities have been little more than a footnote to the 38GW of solar in Germany, the rooftop revolution in the US and Australia and 9GW of solar in the UK over the past decade, oblivious or otherwise, but losing customer and generation revenues as a consequence. The “revenue franchises” which set apart the various roles of supply chain, generator, network and retailer are being eroded as companies realize that they are leaving margin on the table, prompting many to expand across the value chain, all the way from manufacturing to generation to supply.

Competitive pressure on both utilities and incumbent challengers is also increasingly coming from outside the sector. The entry of companies from industries including telecom, IT, automotive, health care, and insurance, which face similar-scale cost pressures but are more advanced in terms of digitization and customer service, will bring new challenges to the energy industry. This is especially true as these new entrants look to deploy their fixed costs to other markets and other areas. These new entrants will also bring similar or more advanced approaches to customer segmentation and lifetime profitability across broad product offerings, while avoiding the tangled nature of the utility industries’ regulatory history. Google’s US$3.2b acquisition of smart thermostat maker Nest in 2014, for example, broke new ground in the smart home industry, while Tesla’s Power wall battery storage system has catapulted it into mainstream energy services.

Deal or no deal

While many utilities have failed to be sufficiently flexible to the global power landscape shifting beneath their feet, the new energy paradigm will force all companies to redefine their purpose, their products and services, customer base and geographical presence, as they find themselves under ever more pressure to compete for revenue streams.

Some may try to expand, using sheer scale to prevail, while others will seek to innovate to capture market share more strategically. In both cases, there will be a decision on whether to achieve the desired goal via organic growth or through acquisitions and joint ventures. Utilities, with some exception, have historically shied away from high-risk innovation, preferring instead to let others tackle this part of the value chain and then buy them in at the appropriate time, suggesting we could see much more M&A activity in the coming years. However, with the risk that target acquisitions may be snapped up by competitors willing to engage earlier or trigger bidding wars, utilities also cannot afford to drag their feet on such decisions.

This in turn requires acknowledgment and remedy of the fact that one of the biggest challenges often encountered by incumbents is their ability to effectively acquire and integrate new businesses, typically due to four factors:

(i) Cultural mindset – whether rooted in the legacy of being a state-owned entity, or inherent tunnel vision that focuses too exclusively on the traditional core business model of selling as much electricity as possible

(ii) Structural challenges – where to put new businesses within often complex and large group structures, including decisions around whether solutions follow business-to-business or businesses-to-customer models

(iii) Valuation – incumbents often struggle to perceive and pay as much value for assets or businesses as, say, private equity firms for example

(iv) Realizing value – rather than the synergies driving the transaction being realized, value is often destroyed as dynamic entrepreneurial companies drown in their more bureaucratic and conservative new environment

Restructuring roulette

A number of utilities and major energy service providers are already initiating corporate restructurings to realign business models with evolving strategic goals. Enel, Iberdola and EDF, for example, have all opted to buy back their respective renewable energy arms after a spell on the stock exchange as listed entities. Enel in particular has been candid about its goal of leveraging full parental control and group resources to become a large integrated renewable energy company, being one of the few growth areas that can really drive its business forward. At the other end of the spectrum, E.ON has split the company into two separate entities focusing on renewables and conventional energy, while German utility RWE and US energy giant NRG Energy have both announced plans to bundle selected arms of their operations into subsidiary entities.
The routes to restructuring are numerous, but all should inevitably aim to address the challenge of having business units with competing interests, fundamentally different focuses, capabilities and time horizons. As such, 2016 is likely to be a year of reckoning for some of these first-mover companies and provide early indications of whether buy-backs, spin-offs, bundlings or a model as yet unseen are likely to prevail in the years ahead.

Financing the new horizons

One of the biggest challenges in tackling the “do or die” conundrum in trying to compete across new products, customers and geographies is how to efficiently fund this strategic change and the new operational models that result. For utilities in particular, this also necessitates a significant shift in mindset, recognizing that they typically no longer represent the cheapest source of capital and that it is no longer necessary, or optimal, to fund everything on the balance sheet, as has often been the traditional model.

The good news is that liquidity is relatively high, with traditional banks returning to the debt market and more equity chasing suitable projects, though this is expected to converge as asset deployment continues to accelerate globally. It will be interesting to see how and when the large number of deals done in 2015 on a pure equity basis will be refinanced and senior debt introduced.

A sustainable proposition

Institutional investors in particular are getting increasingly comfortable with maturing clean energy assets such as wind and solar that offer the much-prized stable long-term inflation-linked yields that the capital markets cannot provide. Some of these investors are now setting up their own low-cost infrastructure funds and even investing directly in specific projects. According to MSCI, there was a 30% surge in exchange traded funds and other equity funds tracking environmental, social and governance indices in the seven months to July 2015, as institutional investors increasingly demand investment products that integrate long-term sustainability. Investors should also benefit from the Financial Stability Board’s proposed industry-led disclosure task force that will develop voluntary, consistent climate-related financial risk disclosures for use by companies in providing information to lenders, insurers, investors and other stakeholders.

It is also anticipated such investors will get more comfortable with developing markets and new technologies once they have built out portfolios in more developed markets. The COP21 reaffirmation of the pledge by developed markets to help flow at least US$100b of climate finance support annually into developing markets by 2020 is also expected to galvanize private sector financing once government and donor funds help to open up new markets and secure precedent transactions.

The right vehicle

There is therefore likely to be demand and opportunity in the coming years for conduits that help institutional and other investors access new energy asset classes and markets. However, 2016 could also prove to be a year of reckoning for vehicles that have gained traction in recent years. While there appears to be continued appetite for green bonds, racking up just over US$40b in 2015, they are also likely to come under more scrutiny over the next 12 months as investors seek greater differentiation beyond simply the “green” credential.

It is also a year of reckoning for the yieldco model, with mounting pressure from retail investors to keep the businesses growing at all cost, despite the underlying assets not designed for such. The health of the broader parent company can also jeopardize the future of a yieldco, as is being seen with Abengoa’s bankruptcy and SunEdison’s restructuring. This has already prompted a yieldco retreat by some companies, although private vehicles could fare better than public ones going forward, operating outside of the vagaries and volatility of the capital markets and offering institutional investors the 20 to 30 year long-term yield that they are looking for. However, there is still likely to be a call to restructure existing vehicles and adjust market expectations.

Regardless, with utilities increasingly needing to offload operating assets in part or full to realize cash and value or alternatively fund M&A transactions that expand their service offerings across the value chain, there is significant opportunity to partner with institutional investors in order to benefit from cheaper capital and compete more effectively.

Getting to know each other

There is now no shortage of investor categories looking to invest in the energy sector – from pension funds to crowdfunding, from sovereign wealth funds to national green banks – and those looking for capital will need to package their investments as attractive opportunities to meet these investors’ different needs. However, with investors themselves now also competing for the best deals, they also will need to develop a better understanding of the stakeholders, strategic drivers and long-term growth prospects underpinning these opportunities and the conduits that can deliver them most efficiently.

Frenemies

There is no single survival guide for navigating this new and continuously shifting energy paradigm. Companies must be more strategic and innovative in using a combination of organic growth, transactions and cheap capital to diversify their products, capture and retain customers, and operate across borders.

What is clear is that there is now no room to be traditional. Utilities in particular must throw off the shackles of the past and embrace their new environment if they are to survive the oncoming waves of competition. In an age of new horizons, incumbent utilities, challenger businesses and an increasingly diverse investor base must compete as both friends and enemies if they are to deliver secure, affordable and low carbon energy to 7 billion people ... and growing.
The better the question, the better the answer...

The main reason many utilities are now playing catch-up while first-mover challenger businesses are thriving is failure to ask themselves what is actually in demand. As a result, they are now losing valuable customers, offering outdated products and operating in the wrong markets.

What?

Simply generating and selling electricity or gas at a regulated rate is no longer enough of a proposition, with consumers increasingly demanding more tangible and integrated value creation across their energy consumption needs.

This means utilities and others need to do more than optimize power sales – they must create greater revenue security through product diversification, emulating the rapid deployment of renewable electricity, distributed generation and demand-side management to capture opportunities and low-hanging fruit in the heat and transport sectors, energy efficiency, smart infrastructure and in more holistic integrated resource management solutions. The post-COP21 focus on emissions reduction is also likely to spur a broader energy focus given achieving country-level targets will require a range of measures beyond renewables generation alone.

However, this does not mean abandoning the more traditional power markets either – cost-effective large-scale generation will remain critical in many markets where rapid economic growth and industrialization are putting pressure on power demand or where significant volumes of conventional generating capacity are being retired. Though nor does it mean utilities can rest on their laurels, as competition intensifies to more effectively and flexibly integrate an increasing volume of renewable energy into the system in parallel with recalibrating output from conventional assets.

Any reassessment of the products and services on offer therefore requires both new thinking and efficient thinking.

Beyond power: the triple line

The words energy and electricity are frequently used interchangeably, masking the fact that energy – often the basis for national or state-level targets – actually comprises heat and transport as well as electricity. In Europe, for example, most markets are well on their way to meeting their 2020 renewable electricity goals, but have been less successful implementing heat and cooling and transport solutions to contribute to the overarching 20% renewable energy target.

Potential heat efficiency solutions are widespread, from replacing fossil fuels with renewable sources such as biomass, solar and geothermal for immediate-use or stored heat generation, to air and ground-source heat pumps, industrial process heat capture and recycling, or solar water heaters replacing often hazardous kerosene-based cooking. Technology innovations are even setting the stage for electricity to be the primary fuel source for heating systems, enabling power providers to bundle offerings or go after revenue streams traditionally dominated by gas and residential oil companies.

In transport, electric vehicles present the most obvious clean energy solution, and while the market is arguably taking longer than expected to gain critical mass, it is still experiencing steady growth, with most manufacturers now offering hybrid or all-electric cars and significant prospects for further cost and efficiency gains. This is creating opportunities to partner with automakers to develop, implement and manage the required charging infrastructure, with a number of different business models emerging and some utilities already starting to include chargers as part of their base rate.

Other opportunities include shifting to low-carbon fuels such as biogas and compressed natural gas or air, fuel efficiency from lighter components, and automation technology solutions that can, for example, use data mapping to analyze traffic congestion and identify the most fuel-efficient route or closest charging station. Such data mapping could even help early autonomous technologies such as “platooning” – linking pairs of vehicles to cut drag – which can reduce fuel consumption by up to 7% according to BNEF. The scalability potential for transport efficiency solutions is also compelling and could create opportunities that feel more like long-term infrastructure investments, from national bus fleets to large-scale marine vessels.

Getting resourceful

Energy efficiency applications are growing in importance as consumers seek to achieve both reduced energy costs and sustainable consumption. Solutions today vary from increasingly intelligent smart meters and thermostats that can be managed and monitored by smartphones to more holistic software systems that collect and analyze millions of data transactions from sensors tracking various energy-consuming applications to diagnose patterns and determine inefficiencies.
This far-reaching potential is also spurring demand for more integrated and intelligent resource management systems that can incorporate efficient water usage, air quality and waste management in addition to sustainable power and heat. Such systems can be embedded into infrastructure, from a single home or factory to an entire city, generating cost and energy savings through more efficient allocation of resources, as well as the potential for self-reliant and/or net zero emissions energy ecosystems.

An increasing focus on resource optimization could also see more heat capture and recycling from industrial processes, and large-scale onsite renewable energy projects being used to run desalination and wastewater recycling plants to produce clean water, or power enhanced oil recovery processes to avoid using potentially more costly and polluting energy sources for commodity extraction.

Technology or affordability is rarely the barrier to achieving this. Being able to design, fund and implement an integrated rather than a piecemeal solution often requires strong sponsorship, leadership, a commitment to invest and the ability to navigate all the necessary regulatory, social, procurement and implementation challenges.

Smart thinking

Though the “smart cities” agenda, like electrical vehicles, has arguably produced more hype than results to date, as is the nature of any transformative process, the economic and societal case is strong for intelligent and integrated energy and resource optimization solutions across a city’s infrastructure—from smart streetlighting and rooftop solar energy to congestion management sensors and wireless IT systems. This presents significant potential for technology innovators, utilities as service providers and investors willing to fund major infrastructure projects in return for stable long-term returns. City and municipality governments, often with budgets that can be more easily deployed at a local level and with fewer political barriers, have the potential to be catalysts for change if they are able to harness, manage and coordinate the visions and ambitions of innovators, investors and technology promoters. COP21 discussions around the need for more climate-resilient infrastructure should also accelerate the imperative for smarter and decentralized resource management systems.

Balancing act

At the same time, however, utilities should also be at the forefront of determining the most economic ways of balancing the growing penetration of variable renewable power. Initially viewed as a challenge to be overcome, such integration is now becoming an opportunity to enhance resilience and efficiencies across the energy system, as well as representing a major new business opportunity for incumbent utilities.

Storage is, of course, widely hailed as one of the most promising ways to achieve this, with broad application potential at a grid level, alongside specific assets and behind the meter. Despite the significant long-term ambitions for energy storage, in the first instance its major value is likely to be in providing system-critical ancillary services, such as frequency regulation, voltage support and reactive power – albeit prompting the need for appropriate regulatory frameworks and remuneration models that accurately value such services – and then increasingly to bridge gaps between renewable power production and demand. The International Energy Agency (IEA) estimates 475GW of energy storage system capacity by 2030, and costs are expected to fall with a similar trajectory to solar PV over the next five years, if not even more dramatically.

However, with these costs still relatively high – around US$350/kWh for lithium-ion battery packs in late 2015 according to BNEF – and varying significantly between applications, electricity generators should also be looking to improve supply and demand balancing through better resource forecasting, more geographically diverse assets to mitigate localized resource intermittency, increased interconnections between grids, smart infrastructure and demand response applications.

Divest with caution

This balancing act becomes even more critical given the increasingly vocal divestment campaign gathering speed as a growing number of corporations and financial institutions pledge to exit or avoid investments in fossil fuels such as coal. However, it’s likely that the most economically inflexible baseload power will be driven out of the market first anyway, with the cost of such plants tending to increase once they are taken off-line, even for small periods, to make use of cheaper renewables with almost zero marginal cost.

However, caution is still advised to avoid draconian quick wins in the carbon battle that blindly lumps all fossil fuels together or artificially accelerates peak demand to the point of destabilizing baseload power supplies. There are no silver bullets, and all generation has a role to play, initially at least. Further, a forced divestment campaign risks simply passing around the financial risk associated with emissions rather than reducing the total amount of risk within the system, potentially calling for investors to put pressure on dividends rather than divestment. This forces fossil fuel asset owners to demonstrate value for money—and even more so if carbon pricing is introduced in multiple markets as expected. The gradual redeployment of oil and gas sector skills to offshore or extraction-based renewable energy or unconventional oil and gas technologies is also potentially preferable to forcing them out of business altogether.

REpower and REinvent

There is also scope to enhance the performance and efficiency of both current and future generating capacity. Decisions around repowering and life-extensions of maturing assets will play an important role in determining the value of operating portfolios, and identifying and maximizing technology innovations will also be key. Such innovations run from larger wind turbines and floating solar installations to more revolutionary technology shifts such as transparent solar panels on windows and skyscrapers or Makani’s Google-sponsored wind kite, which claims to generate up to 50% more energy than conventional turbines. There is also a growing opportunity to tailor technology solutions to specific markets – for example, turbines suitable for low-wind yield sites in Europe now that many high-resource sites have been saturated, mega-scale solar projects in India to consolidate infrastructure and logistical efforts, or siting multiple projects on sites with existing grid network access where transmission systems are relatively weak.
Who?

However, even if utilities work hard to innovate with new services and better integrate clean power assets into the world’s energy systems, what about the “lost generation” of customers?

While many utilities were continuing to view their customersagnostically as just account numbers to be billed periodically for electricity sold at the highest price from existing generation assets, the challenger businesses were realizing that what energy consumers want is different from what they are often given. The result has been more tailored or segmented products and services for specific types of energy users or even individual off-takers of sufficient scale, as small becomes the new big.

It’s unsurprising then that the rapid growth, availability and affordability of decentralized generation solutions such as rooftop solar, micro turbines, storage, smart energy management devices and microgrids has enabled competitors to create significant customer churn for utilities’ core product of grid-connected generation by empowering and incentivizing many to take control of their own energy supply and demand. Navigant forecasts that around 346GW of distributed solar PV alone will be installed in 2015-24, producing US$670b in revenue for the industry. This compares to an additional 290GW of utility-scale solar expected to come online in the same time frame.

Shared efforts

Community-scale projects are also becoming more economically attractive for consumers and growing in scale (e.g., TriGlobal’s 500MW South Plains Wind Farm in Texas), as well as creating new service model opportunities for utilities, project developers and investment conduits. The Clean Energy Collective, for example, is installing shared solar arrays across rooftops in New York City that will be administered by utilities and financed by local homeowners making an up-front investment in a portion of the system in return for net metering credits on their energy bills.

Boardroom backing

A growing number of commercial and industrial corporations are bypassing utilities and seeking out project development and financing partners for direct power purchase agreements (PPAs), whether to meet specific clean energy targets or as part of a broader energy optimization strategy. This can involve direct consumption of onsite renewable energy (particularly for energy-intensive operations such as data centers or industrial process) or virtual and back-to-back power PPAs for electricity generated offsite.

Going public

Utilities also shouldn’t underestimate the needs of the public sector as a critical segment of any customer base – typically the largest energy consumer in any market and with the ability to create critical mass for the implementation of new technologies or solutions spanning the entire energy infrastructure spectrum. In particular, many governments are now setting themselves specific clean energy or energy efficiency targets; for example, all US federal agencies must achieve 20% renewable energy generation target by 2020, while Bangladesh has mandated rooftop solar on all government buildings within two years.

Know your audience

The question is therefore whether utilities themselves are now also ready to become more granular in their focus on customer needs, to either regain these lost customers or at least learn lessons going forward. After all, this is not a trend that looks set to abate any time soon.

Project Sunroof, for example, uses Google Earth’s high-resolution aerial mapping to help homeowners calculate their own roof’s solar energy potential and the potential energy bill savings. Launched in the US in August 2015, the tool also matches homeowners with local solar providers such as SunEdison Inc. Companies are also finding new ways to target customers, such as NRG Energy Inc providing discounts on residential solar systems to people who list their homes on Airbnb.
Where?

In addition to thinking more strategically about customers and products, another dimension to the shifting energy landscape is the creation of a more global market and the opening up of new frontiers as market economics take over, the role of policy shifts and competition intensifies.

A more global market undoubtedly brings energy companies and investors greater choice and opportunities, but also greater competition. While some utilities have already spread their wings beyond their domestic markets, including former state-owned utilities such as Enel, EDP, EDF and Iberdrola, many are still relatively confined to specific jurisdictions and sectors. With most countries now facing some kind of energy imperative and COP21 in particular creating greater transparency, scrutiny and accountability for the transition to low carbon economics, finding ways to compete in new markets, or else gain visibility of alternative business models or solutions that could be applied in domestic markets, will be critical for utilities seeking to compete with more geographically diverse energy service providers.

Back to basics

Even utilities or major energy companies that currently enjoy de facto monopolies in their own markets are unlikely to be shielded from competition long-term as global energy challengers become ever-more confident to go after their customers. Governments will also likely come under increasing pressure to liberalize energy markets still under heavy state control, prompting the unbundling of generation, distribution and transmission assets in a controlled manner as a precursor to privatization that further drives competition and cost efficiencies.

However, in some developing markets, the lack of a creditworthy utility off-taker is stalling investment and growth, despite the opportunity. This necessitates a period of restructuring and tailored credit enhancement solutions to make often debt-crippled utilities cash positive and provide investors with more tangible assurances around project payment terms and risks. A tradition of heavily subsidized energy prices in some markets also makes it near-impossible for utilities to charge cost-reflective tariffs that enable them to break even – never mind operate profitability. While such restructurings can be complex and politically sensitive, policymakers must try to prioritize the creation of long-term sustainable, affordable and investor-friendly energy markets, leveraging support from donor organizations and the private sector where possible.

Shifting policy

The new energy horizons cannot be exploited in isolation of policy at a national and regional level, however. Reflection on the often distorting impact of energy policies in recent decades creates a call to action on governments to shift the focus from intervention to enablement, creating conditions for competition and innovation.

This is something that utilities can and should be leading the charge on, instead of lobbying for protection. It will necessitate breaking down entrenched regulatory frameworks and the rethinking of standards, protocols and relationships as new asset classes and business models are incorporated to create more efficient and resilient energy systems. This includes designing energy systems that will attract the cheapest long-term capital – capital that will have certain requirements but that will also be there for the lifetime of the related infrastructure, in turn having a direct benefit on consumer pricing and removing inefficiencies from the process.

Critically, this shift will also require measures to enable a level playing field and determine the true cost of energy, including the removal of all types of energy subsidies and enabling the market to price externalities, such as the right to pollute via carbon pricing. More clearly defined goals around value for money and affordability should also facilitate the use of public-private partnership models to manage major capital and infrastructure programs that may not otherwise be developed.

Reinvent or rest in peace

The next 12 months will require both incumbent and new entrant companies spanning all elements of the value chain to challenge themselves on the customers they are targeting, the goods and services they are providing and the markets they are operating in. With the competition volume now dialed up to its maximum, asking the right questions will be the only way to get the right answer.
The opening up of new frontiers in parallel with the recalibration of more mature markets are reoccurring themes underpinning our RECAI report as we continue to chronicle the relative attractiveness of the world's renewable energy markets. Watch this space for our April 2016 index refresh, but the graphic below provides an indication of how we see these markets faring in the 12-18 months ahead.

**Global energy market outlook**

**Must try harder**  
A weak 2015 or more fundamental underlying challenges makes 2016 a make-or-break year for these markets

- Australia  
- Greece  
- Italy  
- Poland  
- Spain  
- Saudi Arabia  
- UK

**Must try harder**  
A weak 2015 or more fundamental underlying challenges makes 2016 a make-or-break year for these markets

- Australia  
- Greece  
- Italy  
- Poland  
- Spain  
- Saudi Arabia  
- UK

**Rising stars**  
Growth markets showing no signs of slowing down and continuing to offer far-reaching energy investment opportunities

- Brazil  
- Chile  
- Egypt  
- India  
- Kenya  
- Mexico  
- Morocco  
- Philippines  
- South Africa  
- Turkey  
- US

**Opportunistic**  
Attractive ad hoc projects or investments given either limited absolute market size or relatively immature market to date

- Ghana  
- Israel  
- Kazakhstan  
- Jordan  
- Myanmar  
- Peru  
- Sub-Saharan Africa  
- Uruguay  
- UAE

**Opportunistic**  
Attractive ad hoc projects or investments given either limited absolute market size or relatively immature market to date

- Ghana  
- Israel  
- Kazakhstan  
- Jordan  
- Myanmar  
- Peru  
- Sub-Saharan Africa  
- Uruguay  
- UAE

**Tricky to call**  
Opportunities have been slow to crystalize, or unclear long-term prospects beyond specific technologies

- Austria  
- Belgium  
- Denmark  
- Ireland  
- Netherlands  
- Norway  
- Romania  
- Russia  
- South Korea  
- Taiwan

**Tricky to call**  
Opportunities have been slow to crystalize, or unclear long-term prospects beyond specific technologies

- Austria  
- Belgium  
- Denmark  
- Ireland  
- Netherlands  
- Norway  
- Romania  
- Russia  
- South Korea  
- Taiwan

**Mature and steady**  
Continuing to offer stable and attractive investment and deployment opportunities, but also relatively mature and increasingly saturated markets

- China  
- France  
- Germany  
- Finland  
- Sweden  
- Japan  
- Norway  
- Belgium  
- Denmark  
- Ireland  
- Netherlands  
- Russia  
- South Korea

**Mature and steady**  
Continuing to offer stable and attractive investment and deployment opportunities, but also relatively mature and increasingly saturated markets

- China  
- France  
- Germany  
- Finland  
- Sweden  
- Japan  
- Norway  
- Belgium  
- Denmark  
- Ireland  
- Netherlands  
- Russia  
- South Korea

**Markets to watch**  
Still relatively immature markets but with the potential to be major growth markets based on sheer scale or energy imperative

- Algeria  
- Argentina  
- Bangladesh  
- Ethiopia  
- Indonesia  
- Iran  
- Nigeria  
- Thailand  
- Vietnam

**Markets to watch**  
Still relatively immature markets but with the potential to be major growth markets based on sheer scale or energy imperative

- Algeria  
- Argentina  
- Bangladesh  
- Ethiopia  
- Indonesia  
- Iran  
- Nigeria  
- Thailand  
- Vietnam
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.

**Demand**

Government, multilaterals and public sector
Strategy, design and implementation of public-private partnership programs

We can assist in the design and implementation of resilient energy strategies and programs that deliver value and confidence

We are helping large corporations to address core energy business risks

**Corporations**
Supporting the development and implementation of portfolio or energy mix optimization strategies, including financing and procurement

**Energy services**

Corporate finance
Fundraising, acquisition and disposal services to support corporate supply chain and energy service transactions and investments

We understand how to drive value across the capital agenda

**Supply**

Infrastructure finance
Primary and secondary financing for energy infrastructure transactions, including strategy, fundraising, acquisitions and disposals

**Generation**

Our services span all stages of the asset capital life cycle

**Transmission**

**Our other services spanning the entire energy life cycle include:**
- Financial, commercial and operational due diligence
- Tax, audit and compliance services
- Valuations and business modeling
- Ratings and debt advisory
- Performance improvement and risk management
Our other energy publications

Available at ey.com/recai

Utilities Unbundled Issue 20

Power & Utilities Capital Confidence Barometer

Plug in: customer

Micrgogrids: utility killers or saviors?

Power transactions and trends Q3 2015

Megatrends 2015: resourceful planet

Women in Power and Utilities Index 2015

From boiler room to boardroom

Offshore wind in Europe

European power asset impairments 2015

Renewables in mining: futuristic or realistic

Rising tide: ocean energy
About EY
EY is a global leader in assurance, tax, transaction and advisory services. The insights and quality services we deliver help build trust and confidence in the capital markets and in economies the world over. We develop outstanding leaders who team to deliver on our promises to all of our stakeholders. In so doing, we play a critical role in building a better working world for our people, for our clients and for our communities.

EY refers to the global organization, and may refer to one or more, of the member firms of Ernst & Young Global Limited, each of which is a separate legal entity. Ernst & Young Global Limited, a UK company limited by guarantee, does not provide services to clients. For more information about our organization, please visit ey.com.

© 2016 EYGM Limited.
All Rights Reserved.

EYG no. DX0383

BMC Agency
GA 0000_04832

ED 06/16

This material has been prepared for general informational purposes only and is not intended to be relied upon as accounting, tax, or other professional advice. Please refer to your advisors for specific advice.

The views of third parties set out in this publication are not necessarily the views of the global EY organization or its member firms. Moreover, they should be seen in the context of the time they were made.

ey.com/recai
ey.com/powerandutilities