

Renewable energy country attractiveness indices



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Global highlights

A new world order is emerging in the clean energy sector with China now the clear leader in the global renewables market, according to this issue of Ernst & Young's country attractiveness indices. The new order also includes four significant new entrants in the rankings: South Korea, Romania, Egypt, and Mexico.

China's record spending on its wind industry this quarter represented nearly half of all funds invested in new wind projects around the world. Such heavy investment has ensured that approximately one in every two wind turbines to go live in 2010 will be in China.

The US, which topped the indices between November 2006 and May 2010, is now five points behind the ascendant China. The continued repercussions of the financial crisis, low gas prices and the uncertain medium-to-long term policy environment have prompted a one point fall this quarter, while China rose two points.

South Korea leads the new entrants to secure 18th position, on the back of its ambitious targets, strong incentives, and robust supply chain. Romania and Egypt both achieved a ranking of 22 as a result of their fast-growing wind markets, while Mexico completes the new line up, ranking 25th, benefiting from challenging targets and strong wind and solar resources. As a result, the Czech Republic has fallen outside the top 30 countries, mostly due to various plans by Parliament to remove or significantly reduce solar subsidies.

Elsewhere in the global economy, India gained a point following the completion of regulations for the trading of renewable energy certificates (RECs) by seven Indian states, with another nine having now prepared drafts. The UK has also climbed a point following its Government's public Spending Review and the publication of a National Infrastructure Plan – both of which signalled strong support for renewables and specific investment in offshore wind. Japan jumped three points due to its solar market expected to increase to four times the 2009 level by 2020.

The lead article discusses progress post the credit crunch, highlighting the differing pace of recovery between Western and BRIC (Brazil, Russia, India and China) nations, and analyzing the effect of commodity and carbon prices. It also looks forward to Cancun and the issues critical to shaping the future low carbon economy, and the need to ensure any agreements reached (however limited) do not ignore the developing world poor.

A new addition to this issue is a page dedicated to the Solar indices, with commentary on key movements in the photovoltaic (PV) and concentrated solar power (CSP) markets. This will be a regular feature, and is supplemented in this issue with a technology focus article on solar CSP, discussing the key markets, the four major technologies, regulatory drivers and recent news.

Ernst & Young was ranked the leading project finance advisor in the Americas, Europe, Middle East and Africa between 2001 and 2009 by *Project Finance International*



Overview of indices: Issue 27

The Ernst & Young country attractiveness indices provide scores for national renewable energy markets, renewable energy infrastructures and their suitability for individual technologies. The indices provide scores out of 100 and are updated on a regular basis.

The main indices (all renewables and wind) are referred to as the “long-term indices.” The near-term wind index takes a two-year view with slightly different parameters and weightings (see right).

The country attractiveness indices take a generic view, and different sponsor/financier requirements will clearly affect how countries are rated. Ernst & Young’s Renewable Energy Group can provide detailed studies to meet specific corporate objectives. It is important that readers refer to the guidance notes set out on pages 27-28 when referring to the indices.

Long-term indices

The long-term indices are forward looking and take a long-term view, hence the UK’s high ranking in the wind index, explained by the large amount of unexploited wind resource, strong offshore regime and attractive tariffs available under the Renewables Obligation (RO) mechanism. Conversely, although Denmark has the highest proportion of installed wind capacity to population level, it scores relatively low because of its restricted grid capacity and reduced tariff incentives.

All renewables index

This index provides an overall score for all renewable energy technologies. It combines individual technology indices as follows:

1. Wind index – 68%
(comprising onshore wind index and offshore wind index)
2. Solar index – 15%
(comprising solar PV index and solar CSP index)
3. Biomass and other resource index – 17%

Individual technology indices

These indices are derived from scoring:

- ▶ General country-specific parameters (the renewables infrastructure index), accounting for 35%
- ▶ Technology-specific parameters (the technology factors), accounting for 65%

Renewables infrastructure index

This provides an assessment by country of the general regulatory infrastructure for renewable energy (see page 11).

Technology factors

These provide resource-specific assessments for each country (see page 11).

Long-term solar index

This index is derived from scoring:

- ▶ The solar PV index – 73%
- ▶ The solar CSP index – 27%

Long-term wind index

This index is derived from scoring:

- ▶ The onshore wind index – 70%
- ▶ The offshore wind index – 30%

Near-term wind index

The near-term wind index takes a forward-looking two-year view based on the parameters of most concern to a typical investor looking to make an investment in the near term. The index is based on separate scores for onshore and offshore wind. For parameters and weightings see pages 27-28.

Comments and suggestions

We would welcome your comments or suggestions on any aspect of the indices. Detailed attractiveness surveys and market reports can be provided, taking account of specific corporate objectives.

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Cancun – low carbon must not ignore the developing world poor

Jonathan Johns, guest columnist

In the May 2009 issue of the country attractiveness indices (CAI), we set out a conceptual framework of how the market for renewables might progress post the credit crunch (see Fig 1 below). Pre-Cancun it is interesting to take a “status check” on where we are now, and what the implications are for the future development of the industry.

One striking feature of the post-credit-crunch world is the difference between the pedestrian pace of recovery in the West and the rapid turnaround in the new BRIC (Brazil, Russia, India, China) economies, which leaves poorer developing countries in danger of being left as the orphans of the new world order; both in terms of growth and engagement in the new low carbon economy.

Most Western economies are following the timing originally anticipated in our analysis and are now transitioning from the stimulus to post-stimulus phase. The recession is over but serious concerns remain, particularly in the US where unemployment stays stubbornly high and quantitative easing remains the policy of choice. There are also concerns in those economies (such as the UK) seeking to aggressively cut financial deficits, and possibly risk a drift back to lower growth and a period of stagnation. Although renewables has been largely protected in policy terms due to the promise of cleantech jobs, the health of the general economy continues to have a major effect on the renewables industry; perhaps more so than some of the headline-grabbing political initiatives.

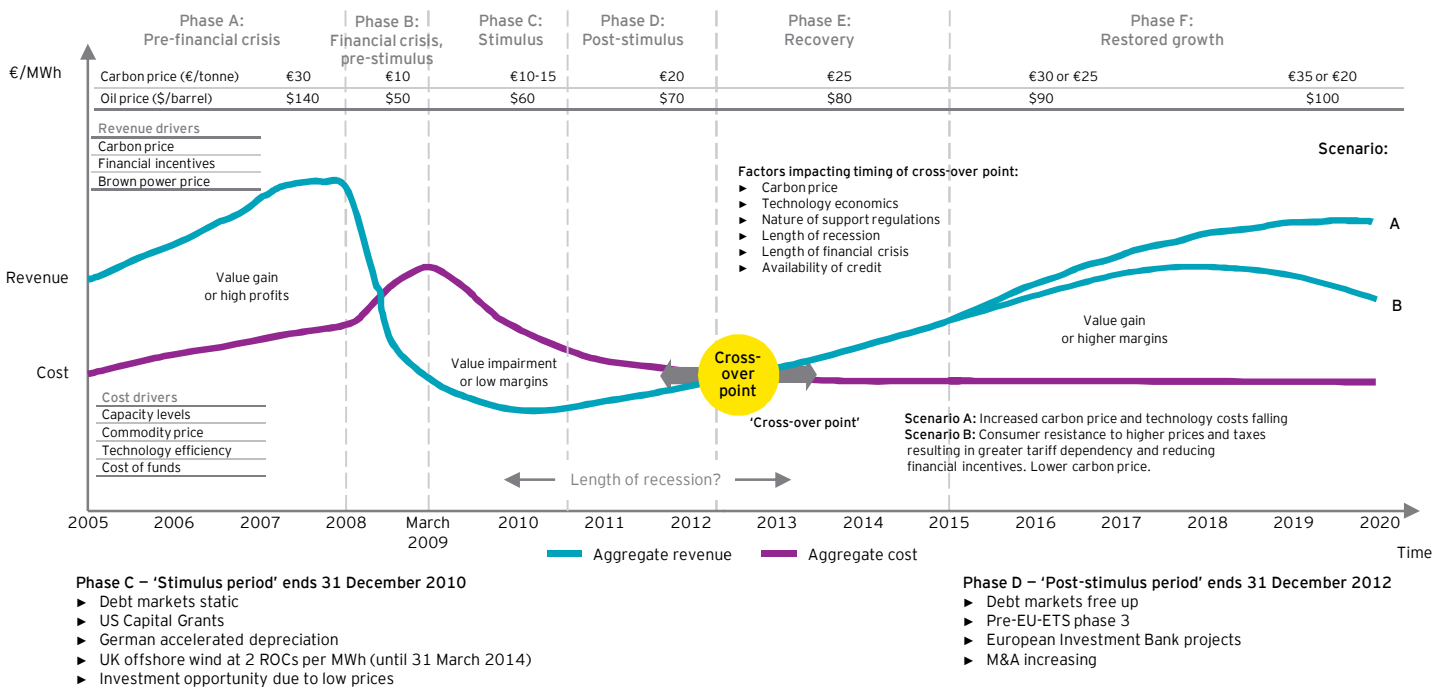
In the West, there remains an overhang of banks still needing to recapitalize and build balance sheets, and a property sector

which may not yet have taken all of the pain due to stimulus-driven low interest rates. For renewables, the issue is that past loan portfolios, built up in the boom times when margins were artificially low, cannot be recycled without banks taking losses – thereby freezing lending capacity. While there are some limited signs of improved flow of project finance to renewables, the volumes needed for the vast amount of capital investment required are not at present there and as the need for low carbon infrastructure burgeons, the funding gap (which runs to US\$trillions over the next few decades) is more likely to widen than close; with equity required just as much as debt.

It is instructive that the debate in the UK as to the role of the Green Investment Bank (whose launch is to be welcomed, albeit at relatively low levels of capitalization), includes those who argue that it should primarily be used to create a conduit for the recycling of bank capital invested in renewable projects to institutional investors via bonds, thereby increasing capacity for new loans. However, others prefer a more direct flow of funds from the bank (on a matching basis) to major new projects such as offshore wind and carbon capture and storage, limiting its effect – as funds are likely to be quickly dissipated, and possibly leaving sectors such as biomass and energy from waste behind.

On the equity markets the signs are that it is still early days in the recovery from recession, with the welcome float of Enel Green Power falling short of targets, and some wind floats in the US being pulled due to the weakness of the energy market there. As a whole, renewable energy market capitalizations have under performed in the past year. (See Equity article on page 8.)

Fig. 1 Ernst & Young conceptual framework for navigating a renewables business through financial crisis



Source: Ernst & Young analysis

In relation to the West achieving the challenging targets for 20% reduction by 2020, the availability of capital is likely to be the most significant constraint – with the often requested high levels of government intervention in all probability unavailable. And if globally we are to meet the mooted 80%-90% reductions required by 2050 to avoid the worst effects of global warming, then it is likely that fundamental changes will be required in the way private sector and public sector capital flows to an energy and electricity industry that itself is likely to require further reform.

The need to attract new capital flows to the sector remains a critical issue as the proportion of institutional funds flowing to infrastructure projects in general (and low carbon infrastructure in particular) compared with to say property is far too low. It is likely that specific interventions, possibly by way of tax incentives analogous to those achieved by REITS (real estate investment trusts), will be required to deliver the fundamental change in emphasis required. Canadian pension funds and some sovereign wealth funds have been among those leading the way on an international basis but low carbon infrastructure needs to be made more clearly the asset class of choice.

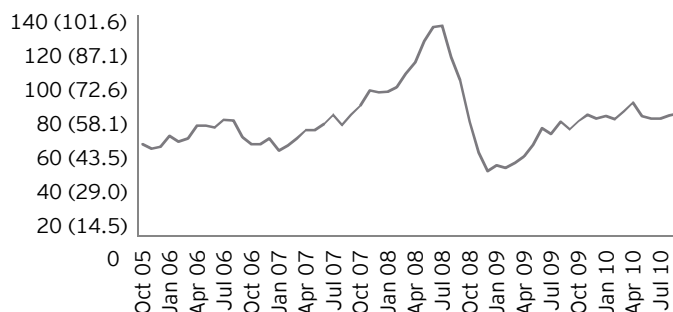
In Asia and other growth markets the story has been markedly different – the recession has in some ways been only a pause for breath, with these economies arguably well ahead of schedule and now entering the Recovery phase.

As these countries tend to have large export surpluses (and strong state finances in the case of China), there is by and large no shortage of capital to build projects. However, issues arise more from the race for capacity growth leading to low project margins – certainly a major barrier to investment for some Western developers/utilities. Indeed, there are signs that Asian manufacturers are now also looking to overseas markets and Asian lenders are increasingly likely to become involved in Western project finance markets, supplemented by those sovereign wealth funds whose balance sheets have been partly restored by the resurgent rise of oil. Indeed, their active involvement in financing the infrastructure of the West could well become a significant feature of the global renewable energy industry, particularly as Asian banks support Asian manufacturers as they expand globally.

The availability of capital for the poorer developing nations is a critical issue for Cancun.

One consequence of the strength of the BRIC economies is that many of the raw materials used by the renewable industries are at prices driven by the post-recession Asian growth economies rather than the still stimulus-influenced Western economies. In this respect, it is interesting to re-examine the trends in key drivers anticipated in our original analysis – the price of oil and carbon.

Fig. 2 Brent crude oil price (US\$(€)/barrel)



Oil prices now circa US\$80 (€58) a barrel have recovered at a much faster pace than originally anticipated principally due to the robust growth in China and India (see Fig. 2). In contrast, the price of carbon, where the West is the primary buyer, has remained deflated due to uncertainty over the prospect of global agreement following Copenhagen, the collapse of the US voluntary market, concerns over the EU Emission Trading Scheme (ETS), and the validity of certain Certified Emission Reductions (CERs). As a consequence, carbon prices on the EU-ETS EU emission allowance (EUA) market have got stuck at about €15/tonne (having recovered early in 2009 from a minimum of about €9/tonne) and sunk to near-zero for the US voluntary Chicago Climate Exchange (CCX) market, which may well be slow to recover given recent US electoral developments (see Fig. 3 and 4).

Fig. 3 EU-ETS EUA prices (December 2010)

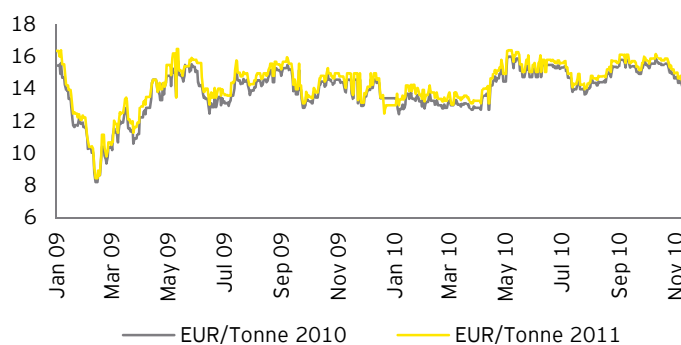
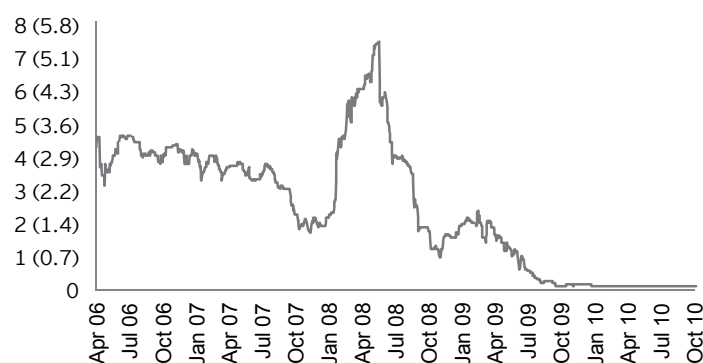


Fig. 4 Chicago Climate Exchange prices (US\$(€))



It is ironic that future price spikes in oil (as predicted recently by the International Energy Agency, IEA) may well be caused by an inability of the global economies to invest sufficiently in low carbon infrastructure now, due to the lack of agreement on the carbon issue. The world is struggling with a classic time-shift issue: needing to invest now to save exposure to rising fossil fuel prices as well as combat global warming at a time in the West when resources are constrained. In practice, the West will be able to absorb prices at spike levels, but for the poorer developing nations the implications will be far more serious.

The existence of a “two stream” world (with the BRIC and other new economies in the fast lane and those in the West hesitant) is of increasing importance to the renewable sector. Not only are China and India ranked 1st and joint 3rd respectively in the current issue of the CAI but 4 new countries have joined the index, in some cases at relatively high levels: with South Korea entering at 18 in the index, reflecting its ambitions in wind (particularly offshore) as well as in solar.

These developments are having an impact on the race for cleantech jobs. Manufacturers such as **Vestas** have begun laying off considerable numbers of staff in their home markets as the focus switches to Asia. In addition, some inward investment into the US has been put on hold as markets are affected by low energy prices, partly due to plentiful supplies of shale gas. In terms of market capitalization, Western wind turbine manufacturers have seen very significant declines in values of 50%-60%, notwithstanding the more general recovery in stock markets, whereas Asian businesses (although not immune to exposure to the US) have fared much better. (See Equity highlights page 8.)

The need for manufacturers worldwide to concentrate on improving output efficiency and reducing cost per kWh produced is likely to be increasingly significant in the next few years; with legislators clearly signalling a desire for support mechanisms to be aggressively degressive.

As remarked in the previous issue of the CAI, solar PV installed in the built environment has the competitive advantage that grid parity occurs at retail price levels whereas for other solar technologies and wind the reference level is the wholesale price of electricity – unless remote net metering is encouraged for industry. This gives solar (with its more readily achievable path of cost reductions) an advantage over onshore wind – although in cost per kWh it remains a long way behind. The need for a relentless focus on cost and output was signalled by **E.ON's** recent call for the industrialization of the offshore wind sector – which remains at the outer edges of the cost envelope. Figures 5 and 6 show the recent history of costs for iron ore and copper, significant to wind manufacture, and silicon which is the prime input for PV. China, of course, has the advantage of controlling rare earth metal supplies critical to cleantech manufacturing.

Fig. 5 Commodity prices (relative to end Sep 2009) – wind supply chain

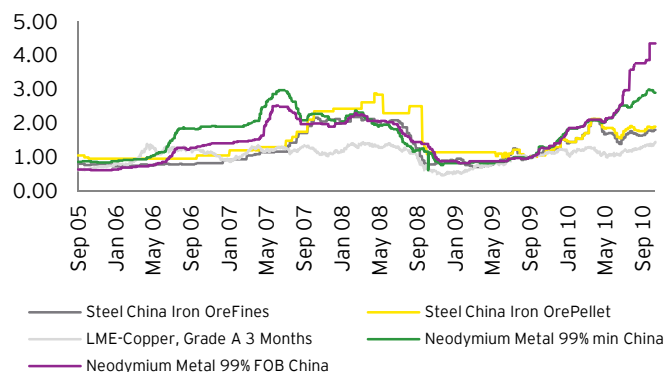
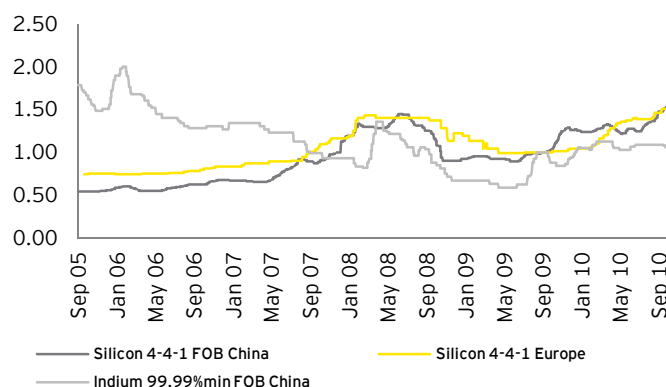


Fig. 6 Commodity prices (relative to end Sep 2009) - solar supply chain



While a focus on cost reduction is the passport toward long-term success for the industry, it remains the case that regulatory policies continue to have a very significant impact on the renewables industry, and indeed cleantech jobs.

In the US, the market for wind in particular is stalling due to the relative ineffectiveness of its support mechanisms and its greater exposure to the impact of falling natural gas prices. In Germany, the feed-in tariffs (FIT) for solar have in the current year led to a boom for manufacturers worldwide, and after relatively strong degression next year, volumes will be well down but still high enough to remain the envy of many other markets. This approach has allowed a number of German and indeed other European solar manufacturers to restructure. In the UK, the strong emphasis on offshore has been rewarded by the announcement of a number of manufacturing facilities with grant incentives surviving the Spending Review.

Manufacturers in the West need to be particularly innovative if they are to preserve their share of the market, and are likely to need a greater proportion of Asian production to remain cost competitive. (This trend is already evident in solar with **Q-Cells** and **REC Solar** shifting manufacture to Malaysia and Singapore for example.)

Conversely, it is not clear yet whether many Asian manufacturers will choose to set up Western facilities to facilitate market entry (to the extent that Japanese car manufacturers did in the 1970s). Some steps have occurred in North America with the trend less prevalent in Europe.

In the next few years, it is likely that there will be consolidation in the cleantech manufacturing industry, in some cases necessitated by financial difficulty or made possible by declining share prices as some companies find it increasingly difficult to adjust to the new paradigm. Mergers and acquisitions driven by large corporates (e.g., to buy in innovation) are also likely to feature – at a time when values remain well below their peaks. The European market is no longer a domestic haven and even some of the largest manufacturers may be vulnerable to takeover or indeed failure, with acquirers just as likely to come from Asia as the West.

Furthermore, it is not clear that energy markets as currently organized allow long-term low carbon investments to be recouped, where those investments are driven by factors not fully represented in current pricing equations. FITs and other support mechanisms are vital in most markets and given the uncertainties over carbon pricing are likely to remain a fundamental tool for some years to come. Indeed, in some jurisdictions, the direction of travel may be that they are modified to deal with investments in other forms of low carbon infrastructure where other approaches fail.

One of the challenges for Cancun, and the successor conference in South Africa, is how to provide a clear framework for the pricing of carbon so that it is properly reflected in the global economy. This is not an easy task with 'cap and trade' in difficulties in the US, criticisms emerging of the EU ETS, and some jurisdictions taking tentative steps toward carbon taxes (or the establishment of a carbon floor price) to provide additional stimulus toward new investment and energy efficiency in their own markets. It is also critical to the flow of capital to the poorer nations, to allow them to move away from reliance on fossil fuels.

Indeed, in the absence of a comprehensive global solution, which is likely to remain elusive, it would be good if there could be a focus on the needs of the developing world, making sure it is not left behind and is able to access the new renewable technologies. A request that all Western and BRIC nations make a percentage (e.g., 5%) of their national support available for suitable projects in poorer nations on terms similar to their national schemes (thereby encouraging utilities and renewable energy developers worldwide) would give tangible reality to corporate social responsibility programs at both a corporate and government level, and allow for technology transfer.

There are also other factors to be considered as we move to a low carbon economy. The arrival of low cost shale gas poses a challenge for the renewables industry in the US, and to a lesser extent Europe, with gas prices in Asia showing a higher trajectory. There is likely to be a new 'dash for gas' and renewables will need to become more competitive to keep up in less supported markets.

More controversial in the low carbon context is the dash for coal in the new economies, with China moving from net exporter to net importer of coal in the space of a year, and both India and China destined to fuel their huge explosion in electricity generation some 40%-60% by way of thermal coal. In these circumstances, it is inevitable that renewables will need to share the stage with carbon capture and storage in terms of government support, with a new market likely to emerge as significant as renewables.

Clear models for carbon pricing are going to be vital if emissions are to decline as needed and savings not dissipated through non-clean coal – especially with current carbon capture and storage projects needing US\$40-US\$60 (€29-€44) per tonne as the price of carbon to break even. This perhaps is one of the most important areas of focus for Cancun and its successors. The EU call for tenders for €4-€6b support for clean coal under NER300 (following shortly on from the UK clean coal program) is to be welcomed – especially as a proportion of EU funds will be made available for novel renewable energy projects.

For the renewables industry, the challenge is to use technological innovation to reach grid parity as rapidly as possible, so that it is the technology of choice rather than of policy support. It need not and should not rely on the carbon price alone to sustain its future development. But, like all low carbon infrastructure, it does need capital and energy market structures which allow the time shift of investment. Germany, through its 'energy concept' providing a pathway toward 80% renewable energy by 2050 and the practical step of €5b low-interest loans for offshore wind, while reforming planning laws for onshore wind and encouraging building-retrofit, provides a useful lead.

And as the West and the BRIC economies from their different growth standpoints negotiate at Cancun over the shape of the world's future low carbon economy, let us hope that the solutions that emerge do not ignore the developing world poor.

Sources

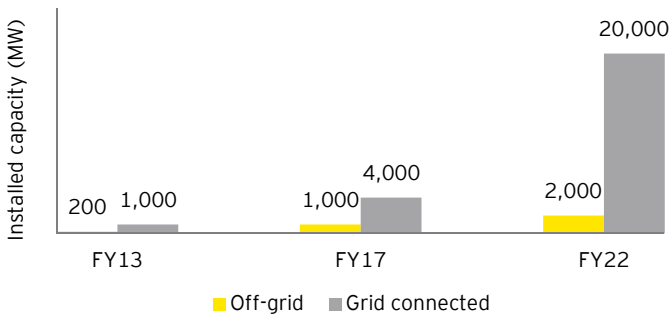
Brent crude oil price: EIA
EU-ETS EUA prices: Bloomberg
Chicago Climate Exchange prices: Bloomberg
Commodity prices (relative) : Datastream, Ernst & Young analysis

Issue focus – India’s National Solar Mission

The National Solar Mission (NSM) was formally launched in January 2010. Launching the mission, the Prime Minister of India Dr. Manmohan Singh emphasized the importance of solar energy by stating that in India’s renewable strategy, the sun should occupy center-stage, literally being the original source of all energy. In addition to achieving environmentally sustainable growth, the NSM is also important in enhancing India’s energy security.

The objective of the solar mission is “to establish India as a global leader in solar energy by creating the policy conditions for its diffusion across the country as quickly as possible.” The mission has set out phased targets for off-grid as well as grid-connected solar power through to 2022.

Cumulative installed solar capacity roadmap



Source: National Solar Mission document

Based on Ernst & Young estimates, this will entail a cumulative investment in the range of INR2,500-INR3,000b (€40- €48b) until 2022.

Solar power off-take and tariffs

The Government has put in place a robust mechanism for assured off-take of solar power generated through grid-connected projects under NSM. **NTPC Vidyut Vyapar Nigam Ltd**, a public sector entity, will act as the nodal agency and will purchase power from the solar power project developers. This will be bundled with a certain quota of electricity from cheaper sources and sold to the distribution utilities. The Government is also proposing to set up a solar payment security fund to address the risk of default in payment by the entities involved in the mechanism.

FITs will be announced by the Central Electricity Regulatory Commission (CERC) on an annual basis. The tariffs for the fiscal year 2010-11 have been set as INR17.9 (€0.28)/kWh for solar PV and INR15.3 (€0.24)/kWh for solar thermal. Given that a large number of entities are likely to apply, the Government expects these tariffs will be discounted by applicants.

For off-grid and decentralized solar applications, the NSM provides incentives through a combination of a 30% subsidy and a 5% interest bearing loan. In the case of rooftop solar PV and other small solar applications, the mission provides for generation-based incentives.

Renewable Purchase Obligation (RPO) to fuel growth

The RPO policy is to ensure that the electricity distribution licensees purchase a portion of their electricity from renewable sources. RPO targets will be announced by the different states depending on their renewable energy potential. States will gradually assume solar-specific obligations within the overall RPO. The NSM policy document envisages a target of 3% for solar RPO by 2022. Ernst & Young estimates that, taking a target range of 2%-3% solar RPO, India would need around 17GW-26GW of solar power by 2022, which substantiates the NSM target of 20GW.

The RPO policy will be supported by a Renewable Energy Certificate (REC) mechanism which is similar to the carbon credit mechanism. The REC mechanism will enable states with a shortfall in renewable energy installations to meet their RPO targets by buying the RECs from other states.

Enhancing domestic manufacturing

The NSM also aims to boost India’s domestic manufacturing capability in respect of components/equipment required by solar power plants. The NSM targets a 4GW-5GW equivalent manufacturing capacity by 2020, including capacities for polysilicon for which India is currently import-reliant. The Government is providing subsidies, tax incentives and efficient approval mechanisms to facilitate manufacturing in India.

Allocation of projects

Subsequent to the announcement of the NSM, the Government has already approved the migration of 16 projects totalling 84MW to the NSM. The Government has also invited applications for new projects under three main categories, to which there has already been an enthusiastic response.

New project application response as at 21 October 2010

Project type	Guidelines released	Current status
Off-grid and decentralized solar applications	June 2010	29 projects (totaling around 20MW) sanctioned
Rooftop solar PV and small-scale solar power	June 2010	96 projects (worth 120MW) have registered
Grid-connected solar power (solar PV and solar thermal)	July 2010	418 applications received; 1,740MW solar PV applications against target of 150MW

Source: Press reports, IREDA, MNRE

It is evident that the Indian Government is intent on executing the NSM in a timely and structured manner and, to date, it appears that the NSM is paving the way to significantly develop India’s solar sector.

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Technology focus – concentrated solar power

Concentrated solar power (CSP)

The basic principle of CSP technology is the concentration of sunlight through sun-tracking mirrors that focus the rays onto a small “receiver” to heat up a fluid. A heat exchanger is then used to generate steam and operate a turbine in a conventional power cycle.

Important features include the capacity for bulk power generation, with plant sizes of up to several hundred megawatts, and also the ability for “hybrid” coupling with a traditional combined cycle gas turbine plant. Another benefit over PV is the ability to store heat (via molten salts) and hence continue to generate power during the night.

Conditions and key markets

Typical regions able to support CSP are those without large amounts of atmospheric humidity, dust and fumes. They include “bush”, savannas, steppes and deserts, ideally located within 40 degrees of latitude north or south. CSP plants may also be conveniently combined with desalination plants.

The economic feasibility of a project is determined principally by the site’s available solar resource, and by the power sale conditions, including grid availability.

CSP plants in operation and under construction are mainly located in Spain and the US. Currently, there is 820MW of CSP capacity installed worldwide.¹ High growth is expected in the MENA (Middle East and North Africa) countries as well as in Australia and India.

Technologies

CSP generation is based on four different types of technologies that share the same set of basic principles but have been implemented through different approaches. Each has a varying degree of technological maturity and potential for efficiency improvements, as shown in the table below.

With potential technology improvements, mass production and automation, economies of scale will be achieved and lower installation costs are likely to follow over the coming years. Capital costs per installed kW are expected to fall from about €3,800 in 2010 to €2,300 by 2050.²

CSP technologies

Parabolic trough	Solar tower	Dish Stirling	Linear Fresnel
<ul style="list-style-type: none"> ▶ High maturity level ▶ 94% of current installations¹ ▶ Long-term, commercially proven technology ▶ Parabolic mirrors ▶ Linear tube receiver ▶ Modularity and many suppliers 	<ul style="list-style-type: none"> ▶ Less mature ▶ Two operating plants in Spain ▶ Field of rotating “heliostat” mirrors ▶ Central point receiver on tower ▶ Operation at high temperature level ▶ High net solar to electrical efficiency 	<ul style="list-style-type: none"> ▶ Less mature ▶ Developed by Stirling in California ▶ Parabolic dish ▶ Stirling engine at focal point ▶ Highest net solar to electrical efficiency with low water consumption ▶ Modular and scalable 	<ul style="list-style-type: none"> ▶ Least mature ▶ Two small test plants in California and Spain ▶ Flat mirrors (or lenses) ▶ Focused onto receiver tubes ▶ Lower cost components but less efficient technology

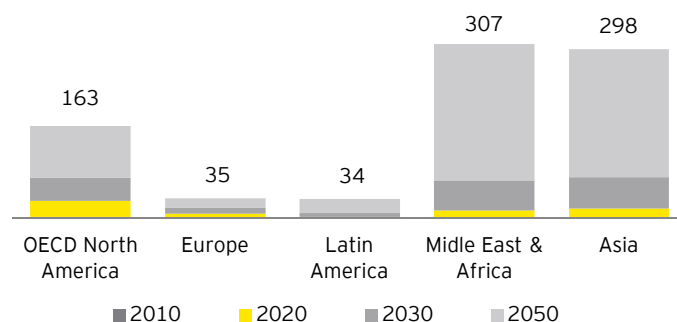
Source: Ernst & Young analysis

1. *CSP Today, The CSP Markets Report 2010.*
2. *Greenpeace, Estela and SolarPACES – Concentrating Solar Power Global Outlook 09 (moderate scenario).*

Regulation

Long-term and stable FITs have so far been the most efficient instrument for sustainable renewable market penetration. Legislated FITs are already in place in Spain, Greece, Italy, France, Algeria, South Africa and Israel, and are under discussion in Turkey.

Forecast accumulated capacity (GW)



Source: Greenpeace, Estela and SolarPACES

Recent news

During the last quarter, the US and Spanish markets have continued to dominate the CSP landscape. In California, **NextEra Energy’s** planned 250MW parabolic trough plant was approved, together with a 392MW heliostat-tower being developed by **BrightSource Energy**. These projects aim to benefit from the Government stimulus grant program that requires construction to start before the end of 2010. Federal land leases have also been given to **Tessera Solar** for a 709MW dish **Stirling** plant.

Meanwhile, in July, Spain became the world’s largest producer of solar thermal electricity with 432MW of installed capacity, after the 50MW Alvarado project was connected to the grid. With more regulatory certainty than for PV, at least 16 projects are under construction, including the 50MW Andasol 3. Other countries such as India and Australia also have several plants under construction, and in Sicily, **Enel** has opened a 5MW test plant for using molten salts thermal storage technology.

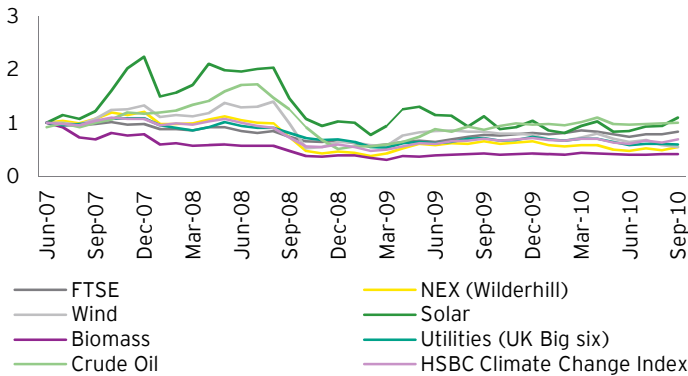
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Issue highlights

Equity markets

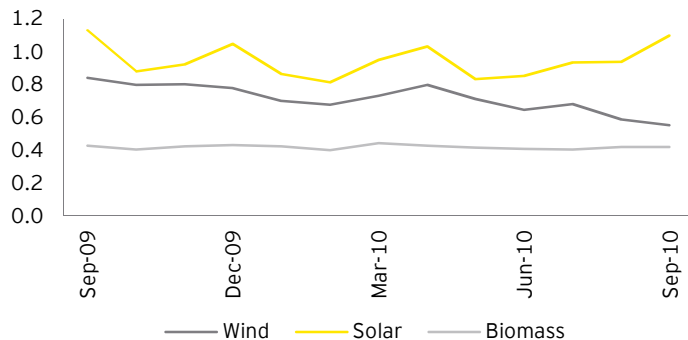
Renewable energy and indices performance



Source: Ernst & Young analysis

During the last quarter, global stock markets have recovered slightly from a "local minimum" in June, such that levels are now similar to six months ago. Compared with a year ago, the NEX has lost 16% of its value despite an uptick in September. However, the third quarter of 2010 has seen a 14% rise in the NEX, which has continued through October.

Sector indices



Source: Ernst & Young analysis

In recent months, two apparent trends have become evident. One appears to be technology related, while another seems to be regionally related.

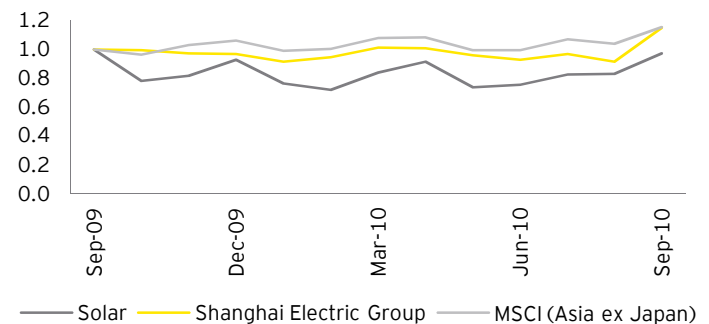
Technology

Generally, wind-focused companies have experienced a more challenging environment due to capital still being relatively scarce. Since the end of April, the Ernst & Young index of 10 major wind players has fallen by 31%, with **Vestas** and **Clipper** impacted significantly. **Vestas** has downgraded its 2010 and 2011 sales forecasts as a result of weaker US and Spanish markets. Meanwhile, in October, **Clipper Windpower** was bought out by its US backer, **United Technologies Corporation (UTC)**, just a few weeks after reporting significant liquidity strains. **UTC** made its first investment in **Clipper** last year, buying just under half of the company. Since then **Clipper** has found market conditions difficult, selling 43 turbines in the six months to the end of June compared with 127 in the same period in 2009.

In other news, US wind developer **First Wind** has delayed plans to raise up to US\$240m (€175m) via an IPO due to an 'unattractive' market.

On the other hand, solar-focused companies appear to have turned the corner, with the sector becoming increasingly attractive. The Ernst & Young index of 15 major solar players has risen by 33% since the end of May. Part of this rise is likely to be fuelled by short-term attractiveness in European solar PV markets, which are currently booming in anticipation of FIT reductions later this year and into 2011. Many solar suppliers are reporting shortages due to high demand.

Solar share prices

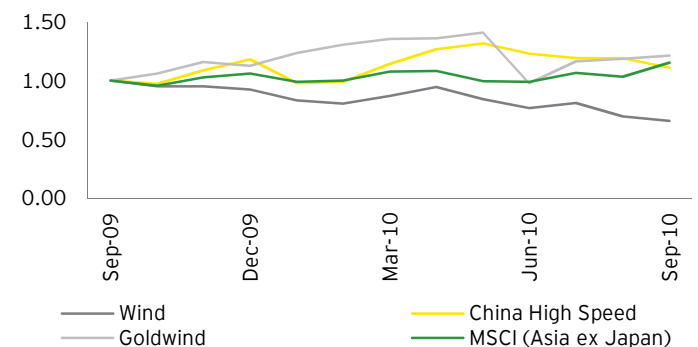


Source: Ernst & Young analysis

Region

As noted in the previous CAI (Issue 26), sovereign debt and FIT concerns in the Eurozone, a growing Chinese economy, and uncertainty in the US wind market (due to the expiration of treasury grants and delays to the Renewable Electricity Standard), have led to an East-West split. However, even some Chinese wind companies are not immune from the challenges in the market. Generally, however, Chinese wind companies are faring better than other countries, reflected by the fact that most of the major IPOs (apart from **Enel**) and equity raisings are now taking place in China: **Huaneng Renewable Energy**, **China Datang Corporation Renewable Power**, and **Xinjiang Goldwind Science & Technology** to name but a few.

Wind share prices



Source: Ernst & Young analysis

M&A activity

General renewables

NRG Energy, the North American Power generation company, has acquired a 100% stake in **Green Mountain Energy**, a US-based power retailer, for US\$350m (€251m). It is estimated the acquisition will increase **NRG's** annual EBITDA by US\$70m (€50m), and secure customers who are willing to pay a premium for electricity generated from renewable sources. **NRG** plans to expand **Green Mountain's** retail business, which markets power from renewable sources in Texas and New York, to other states, however, **Green Mountain** will continue to be run as a stand-alone business within **NRG**.

Omega Energia, the Brazilian renewable energy generator, is set to receive funding of up to BRL350m (€148m) from a joint investment by global private equity firm, **Warburg Pincus** and Brazil's private and public asset manager, **Tarpon Investimentos**. **Omega** will use investment proceeds to expand its renewable energy capacity beyond hydro to also include wind and solar power generation.

Wind

According to **Mercom Capital Group**, there were 9 wind sector M&A transactions in Q3 2010, of which 3 were disclosed totalling US\$922m (€662m), compared with 23 deals in Q2 2010, of which 7 were disclosed with an estimated value of US\$515m (€374m).

The most significant of these Q3 wind transactions was **Exelon Corporation's** announcement in late August that it would acquire **John Deere Renewables**, the wind operation and development business of the US-based **Deere & Company**. Under the terms of agreement, **Exelon** will acquire **John Deere Renewables' 735MW** of installed, operating wind capacity spread across 36 projects in 8 states. The acquisition is valued at approximately US\$860m (€618m), with a provision for an additional US\$40m (€29m) upon commencement of construction on projects totalling 230MW in advanced stages of development. **John Deere Renewables** has another 1.2GW of wind projects in early stages of development, which **Exelon** may choose to continue developing. The transaction is expected to be closed in Q4 2010.

United Technologies is set to acquire the remaining 50.1% stake in **Clipper Windpower** for £70.45m (€82m), giving it full control over the company. **United Technologies** offered to acquire the remaining stake in the UK-based wind turbine manufacturer and wind project developer after reduced turbine orders and delayed projects left **Clipper** struggling to finance its operations.

Solar

In September, **Hanwha Chemical Corp** acquired a 49.99% stake in **Solarfun Power Holdings**, a China-based manufacturer of PV cells and modules, for approximately US\$370m (€266m). The transaction comprised two elements: **Hanwha** purchased 36.5m ordinary shares from **Solarfun** at a price of US\$2.14 (€1.5)/share, with proceeds of approximately US\$78m (€56m) going to **Solarfun** to fund its expansion plans. In addition, **Hanwha** acquired all shares held in **Solarfun** by **Good Energies** and **Yonghu** for a consideration of approximately US\$292m (€210m).

Sharp Corporation has secured a 100% stake in US-based solar project developer **Recurrent Energy**, for a consideration of US\$305m (€223m). Through the acquisition, **Sharp** intends to offer a more integrated solution to the solar PV market, extending beyond the development and manufacture of solar cells, to include the development and marketing of operational solar plants. **Recurrent** announced that it currently has a development pipeline of approximately 2GW, with over 330MW of CSP projects, mainly in North America, in addition to projects and JVs in Europe and the Middle East.

In early October, **SunEdison** announced the sale of a 70MW PV array in Rovigo, northeast Italy, to private equity firm **First Reserve** for €276m. When completed, the Rovigo plant is expected to be the largest operating solar power plant in Europe. **First Reserve** has made an initial payment of €46m to **SunEdison**, with the balance to be paid upon interconnection of the plant, which is expected to occur by the end of the fourth quarter of 2010.

Time Infrastructure Holdings is set to acquire a 100% stake in **Goldpoly International**, a China-based solar cell manufacturer, for HKD1b (€92m). The acquisition forms part of **Time Infrastructure's** strategy to diversify into the Chinese solar market.

Other

Thüga, a German company based in Munich that owns minority stakes in 90 municipal energy companies, is founding a renewable energy JV with around 40 city energy organizations. The JV is expected to invest a total €1b in renewables projects within the next decade.

Sources

All information relating to M&A activity in the sector is obtained from publicly available sources.

IPO activity

General renewables

Enel, the Italian energy group, has raised approximately €2.3b through the issue of 1.42 billion shares in its renewables business, **Enel Green Power (EGP)**. It represents the largest IPO in Europe for three years. **Enel**, Europe's most heavily indebted utility, had initially sought to raise at least €3b from the IPO offering 32.5% of the business, to help cut its debt to €45b and reduce the risk of a ratings downgrade. Overall, demand for the shares was 1.75 billion for 1.6 billion shares on offer out of a total of 5 billion shares. Shares were eventually priced at €1.60, the lower end of the recently revised price range. However, this did not prevent shares falling more than 4% in early trading when they debuted on the Milan and Madrid stock exchange on 4 November, having struggled to attract institutional investors. Only 22% of **EGP** shares on offer went to institutional investors, with the majority going to smaller investors attracted by an offer of a bonus share for every 20 they still hold in a year's time.

Chinese utility, **Huaneng** is also looking to spin off its renewable energy arm. **Huaneng Renewable Energy**, the China-based wind projects developer, plans to raise up to CNY10b (€1b) via an IPO on the Hong Kong Stock Exchange. The plans, announced in August, indicate that 2.9 billion shares will be offered at a price range of CNY3-CNY4 (€0.33-€0.44).

Not to be outdone, China's second largest power company, **China Datang Corp.** is planning a HKD7.7b (€700m) IPO for its renewable power division. It is reported that the Hong Kong Stock Exchange will hold a listing hearing for the **Datang** IPO by the middle of November, and that **China Datang Corporation Renewable Power** could make its debut on the stock exchange as early as December.

Elektra Holding, a Bulgaria-based renewable energy project developer, plans to raise up to €680m via an IPO on the Spanish Stock Exchange. **Elektra** is considering a Spanish listing because its majority shareholder is a Spanish citizen and it also considers the country to have a well-developed capital market. An announcement in September suggests plans to list in November.

In late September, **Orient Green Power**, an Indian renewable energy project developer, planned to raise INR9b (€145m) via the issue of 166.9m shares at a price range of INR47-INR55 (€0.76-€0.89) per share. The IPO represents the largest public equity deal to date by an Indian renewable energy company. The overall subscription was just 1.07 times and the company closed on 24 September with an offering of just under 167 million shares at the lower price of INR47 (€0.76). This generated an estimated INR7.8 b (€126.3m), falling slightly short of its target.

Wind

China's largest non-state owned or controlled wind turbine manufacturer, **Ming Yang Wind Power Group Ltd**, lost 5.4% on its share value in its New York Stock Market debut in early October. The company sold 25 million American Depositary Shares for US\$14 (€10) each in its IPO, raising about US\$350m (€251m). It had planned to sell shares for US\$14-US\$16 (€10-€12) each, so this was at the bottom of its pricing range. The company is planning to use the proceeds from the IPO to expand production capacity and for R&D.

Meanwhile, Chinese wind-turbine maker, **Xinjiang Goldwind Science & Technology Co.**, priced its Hong Kong IPO at the top end of its indicative range at HKD17.98 (€1.67) a share. **Xinjiang Goldwind** raised approximately US\$916m (€658m) from the sale of a 15% stake in the company, after previously deciding to scrap plans to raise US\$1.2b (€862m) earlier this year due to volatile markets.

In October, **China Suntien Green Energy Corp**, a China-based wind power project developer, sold 1.08 billion shares, equivalent to 35% of its enlarged share capital, raising approximately US\$369m (€265m). The proceeds will be used to build wind farms and develop natural gas projects in China. The company was able to price its Hong Kong IPO at the top of the indicative range, achieving HKD2.66 (€2.5) per share. However, on its first day of trading (13 October), the stock dropped 3.8% to HKD2.56 (€2.4).

Solar

Risen Energy, a China-based PV cell and module maker and PV plant developer, has raised CNY1.9b (€204m) via an IPO on the Shenzhen ChiNext Board. The company intends to use a portion of the proceeds to fund two solar projects, including a manufacturing plant for 75MW of crystalline-silicon PV products, and an R&D program for PV technology.

Sources

All information relating to IPO activity in the sector is obtained from publicly available sources.

All renewables index at November 2010

Rank ¹	Country	All renewables	Wind index	Onshore wind	Offshore wind	Solar index	Solar PV	Solar CSP	Biomass/ other	Geo-thermal	Infra-structure ²
1 (1)	China	71	76	79	69	60	67	40	58	51	76
2 (2)	US ³	66	66	70	56	72	70	75	61	67	60
3 (3)	Germany	63	66	63	73	54	65	22	63	54	62
3 (4)	India	63	64	71	42	67	68	63	58	45	65
5 (5)	UK	62	68	64	79	40	54	0	59	38	71
6 (5)	Italy	61	62	65	53	65	67	59	56	65	67
7 (7)	France	58	60	62	57	52	62	24	59	36	62
8 (8)	Spain	56	56	61	42	64	62	69	50	33	55
9 (9)	Canada	54	60	65	46	34	46	0	49	34	62
10 (10)	Portugal	52	55	59	42	49	58	22	45	33	57
11 (10)	Ireland	51	58	58	57	26	36	0	48	28	61
12 (14)	Sweden	50	54	54	53	32	44	0	55	34	53
12 (12)	Greece	50	52	56	41	55	60	41	41	32	52
12 (12)	Australia	50	50	53	41	54	56	46	45	59	53
15 (19)	Japan	48	48	50	41	54	64	27	39	43	57
16 (15)	Netherlands	47	53	51	57	34	47	0	40	21	43
16 (16)	Poland	47	52	56	42	32	43	0	42	23	47
18 (16)	Brazil	46	47	52	35	41	46	30	49	22	46
18 (16)	Belgium	46	52	50	57	31	42	0	39	28	52
18 (na)	South Korea	46	47	46	51	46	53	28	41	35	43
21 (20)	Denmark	44	47	44	56	29	40	0	45	32	51
22 (na)	Romania	43	46	48	38	32	44	0	43	38	43
22 (na)	Egypt	43	44	47	35	48	47	50	37	27	40
22 (21)	Norway	43	47	48	45	22	30	0	44	30	48
25 (na)	Mexico	42	43	43	41	45	46	39	38	54	38
25 (22)	New Zealand	42	47	51	36	24	32	0	34	50	45
27 (24)	South Africa	41	43	46	35	37	35	45	35	32	43
28 (23)	Turkey	40	42	45	34	38	42	27	35	42	41
28 (25)	Austria ⁴	40	38	47	0 ⁴	40	54	0	49	34	52
30 (27)	Finland	38	41	42	36	20	27	0	50	24	40

Notes:

Source: Ernst & Young analysis

1. Ranking in Issue 26 is shown in brackets.
2. Combines with each set of technology factors to produce the individual technology indices.
3. This indicates US states with RPS and favorable renewable energy regimes.
4. Technology weightings have been adjusted for landlocked countries to reflect the lack of offshore potential.

China has risen two points in the All renewables index following strong growth in its wind installations underpinned by record levels of investment, which in Q3 represented just under half of all funds invested into new wind projects globally.

Approximately one in two wind turbines to go on line in 2010 will be in China.

The Chinese Government's underlying support remains very strong, with payments/subsidies to companies generating electricity from wind power, solar panels and biomass feedstocks rising to CNY3.7b (€397m) from approximately CNY2b (€214m) the year before.

The US falls a point as its market continues to be challenged by the fallout from the financial crisis, low gas prices and the uncertain medium- to long-term policy environment, with limited

optimism that a Renewable Electricity Standard (RES) will be approved. The 1603 Treasury Grant is due to expire at the end of 2010 and the likelihood that it will be extended is looking increasingly slim.

India rose one point following the news that seven Indian states have completed regulations for the trading of RECs, while another nine have now prepared drafts. India's federal power regulator also wants to permit the award of RECs to renewable power plants owned by companies for self-consumption.

It was also announced in Q3 that India's Central Electricity Regulatory Commission has reduced the capacity required for RE projects to become eligible for grid connectivity to 50MW.

All renewables index at November 2010 (cont'd)

The UK has increased a point following the publication of the Government's Comprehensive Spending Review and National Infrastructure Plan, both of which signal continued strong support for renewables and recognize the need to invest in offshore wind infrastructure.

The UK Spending Review also included £1b (€1.1b) to capitalize the Green Investment Bank. The UK energy regulator Ofgem has also introduced a new pricing model to encourage the £32b (€37b) of investment needed to update its transmission system.

Portugal climbs one point in the quarter, owing to its green policies and ambitious target to produce 45% of energy from renewables by the end of 2011, up from 17% five years ago. Installed RE capacity has more than tripled from 2004 to 2009, from 1,220MW to 4,307MW.

Portugal's 354MW second phase of the ENEOP 2 onshore wind financing has been mandated by a banking group comprising **Barclays, BBVA, CaixaBI and Santander**, totalling circa €400m.

Sweden has risen one point, following the proposed joint Swedish-Norwegian green certificate (GC) system, to be launched in January 2012. This is likely to attract additional investment in both countries' renewables industries, with increases expected in hydropower in Norway, biomass in Sweden and wind power in both countries.

However, Norway's overall score remains unchanged as the joint GC system potential may be hampered by limited subsidies to the renewables sector compared with the oil industry, which receives five times as much.

Japan jumped three points in the All renewables index, driven by the potential for its solar cell market to grow nearly fourfold from its 2009 level to JPY487.1b (€4.3b) by 2020, given the Government's climate policies such as the household solar installation subsidy FITs introduced in 2009.

The Japan Bank for International Cooperation has set aside US\$4b (€2.8b) to invest in renewable energy and carbon projects in the two years to March 2013. Japan's electric utilities also plan to spend JPY600b (€5.3b) over the next decade to build smart grids, primarily for making optimal use of power from renewable energy.

South Africa rose a point, following the unveiling of a long-term power plan by its Department of Energy. Renewables will make up 16% of South Africa's energy mix by 2030.

Turkey fell one point, given the continued postponement by Parliament for action on legislation to foster renewable energy.

Finland has increased four points, as it begins to promote RE via FITs for wind and biogas which will come into force on 1 January and last for 12 years. The FITs target will be €83.50 per MWh, with wind power to be paid €105 per MWh for the first three years to ensure implementation. Electricity from biogas will get an additional €50 per MWh for combined heat and power (CHP) generators.



Wind indices at November 2010

Rank ¹	Country	Wind index	Onshore wind	Offshore wind	Near-term wind
1	(1) China	76	79	69	86
2	(3) UK	68	64	79	51
3	(2) US ²	66	70	56	74
3	(4) Germany	66	63	73	46
5	(5) India	64	71	42	53
6	(6) Italy	62	65	53	46
7	(7) France	60	62	57	47
7	(7) Canada	60	65	46	48
9	(9) Ireland	58	58	57	40
10	(10) Spain	56	61	42	46
11	(11) Portugal	55	59	42	38
12	(13) Sweden	54	54	53	36
13	(12) Netherlands	53	51	57	37
14	(16) Poland	52	56	42	40
14	(13) Belgium	52	50	57	37
14	(13) Greece	52	56	41	40
17	(17) Australia	50	53	41	40
18	(22) Japan	48	50	41	26
19	(19) Brazil	47	52	35	37
19	(18) Norway	47	48	45	33
19	(na) South Korea	47	46	51	30
19	(19) New Zealand	47	51	36	32
19	(19) Denmark	47	44	56	34
24	(na) Romania	46	48	38	36
25	(na) Egypt	44	47	35	34
26	(23) South Africa	43	46	35	36
26	(na) Mexico	43	43	41	31
28	(23) Turkey	42	45	34	32
29	(25) Finland	41	42	36	30
30	(26) Austria	38	47	0	31

Notes:

1. Ranking in Issue 26 is shown in brackets.
2. This indicates US states with RPS and favorable renewable energy regimes.

Source: Ernst & Young analysis

China, rising a point in Q3, now ranks as the world's largest wind power market, surpassing the US. A study by the Global Wind Energy Council (GWEC) forecasts that installed capacity in China could soar tenfold by 2020, up from 25GW at the end of 2009.

The UK has risen above the US following Government policies favoring offshore wind, with £60m (€69m) ear-marked to upgrade UK ports to handle equipment for offshore wind projects and encourage offshore wind manufacturing operations in the UK. **Gamesa** is the latest company to announce its intention to locate its offshore wind energy business in the UK.

Germany climbed one point, driven by the Government's pledge of €5b in low-interest loans to help develop its offshore wind capacity as part of its new energy plan. **Vattenfall** is also investing over US\$1b (€0.7b) in an offshore wind farm in Germany.

France has increased one point in the Offshore wind index as it joins the race to build large-scale offshore wind farms, having sought bids for 3,000MW of projects that could cost approximately €10b to develop.

Spain dropped a point, following the slow pace of Spanish wind power investment after the Government changed the procedure for registering projects. Spanish wind farms added 727MW of turbines in the first half of the year.

Brazil rose one point in the Onshore wind index, following the success of two auctions that contracted power from 70 wind farms, along with 12 biomass power plants and 7 small hydro plants. The auctions contracted 2,892MW of capacity at an average price of BRL133.56 (€56.5)/MWh.

Near-term wind index at November 2010

Rank ¹	Country	Wind index
1	(1) China	86
2	(2) US ²	74
3	(3) India	53
4	(3) UK	51
5	(9) Canada	48
6	(6) France	47
7	(5) Germany	46
7	(6) Italy	46
7	(6) Spain	46
10	(10) Ireland	40
10	(11) Greece	40
10	(13) Poland	40
10	(11) Australia	40
14	(14) Portugal	38
15	(18) Brazil	37
15	(15) Belgium	37
15	(15) Netherlands	37
18	(19) Sweden	36
18	(17) South Africa	36
18	(na) Romania	36
21	(21) Norway	33
22	(22) New Zealand	32
22	(22) Turkey	32
24	(na) Mexico	31
24	(24) Austria	31
26	(na) South Korea	30
26	(27) Finland	30
26	(na) Egypt	30
29	(19) Denmark	27
30	(26) Japan	26

Notes: Source: Ernst & Young analysis

1. Ranking in Issue 26 is in brackets.
2. This indicates US states with RPS and favorable renewable energy regimes.

China climbs a further five points as it conducted the tender for the nation's first batch of offshore wind power projects in Q3. The four offshore projects, located in the coastal areas of Jiangsu province, have a total installed capacity of 1,000MW and are expected to lure a combined investment of over CNY20.8b (€2.2b).

The US falls two points, given the continued unfavorable policy environment and adverse macroeconomic conditions, leading to a 71% fall in the construction of wind farms in the US compared with the same quarter in 2009. Limited growth is expected next year.

India suffered a one-point drop, as figures released by the Indian Ministry of New and Renewable Energy (MNRE) show that India is likely to miss its new wind power capacity targets for the third year in a row. Only 205MW was installed in the quarter (April-June) compared with an annual target of 2,000MW.

Poland saw a one-point rise, given Poland's onshore wind installed capacity passed the 1GW mark in the middle of the year, the key driver appearing to be one of the most generous green certificate schemes in Europe. Wind farm operators in Poland get approximately €65/MWh on top of the regular sales price for electricity, and under a "buyer of last resort principle," generators are guaranteed payment for all green certificates they receive.

Sweden increased a point, following the inauguration of the 95.4MW Havsnas wind farm on 2 September by UK-based private equity group **HgCapital**, and **Nordisk Vindkraft**, a subsidiary of the UK-based wind power developer **RES group**. Havsnas is billed as Sweden's biggest wind farm to date.

Solar indices at November 2010

Rank ¹		Country	Solar index	Solar PV	Solar CSP
1	(1)	US ²	72	70	75
2	(2)	India	67	68	63
3	(3)	Italy	65	67	59
4	(4)	Spain	64	62	69
5	(5)	China	60	67	40
6	(6)	Greece	55	60	41
7	(10)	Japan	54	64	27
7	(7)	Germany	54	65	22
7	(8)	Australia	54	56	46
10	(9)	France	52	62	24
11	(11)	Portugal	49	58	22
12	(na)	South Korea	46	53	28
13	(na)	Mexico	45	46	39
14	(na)	Egypt	44	44	44
15	(12)	Brazil	41	46	30
16	(14)	Austria	40	54	0
16	(16)	UK	40	54	0
18	(15)	Turkey	38	42	27
19	(17)	South Africa	37	35	45
20	(18)	Netherlands	34	47	0
20	(19)	Canada	34	46	0
22	(na)	Romania	32	44	0
22	(20)	Sweden	32	44	0
22	(21)	Poland	32	43	0
25	(22)	Belgium	31	42	0
26	(23)	Denmark	29	40	0
27	(24)	Ireland	26	36	0
28	(25)	New Zealand	24	32	0
29	(26)	Norway	22	30	0
30	(27)	Finland	20	27	0

Notes:

1. Ranking in Issue 26 is shown in brackets.
2. This indicates US states with RPS and favorable renewable energy regimes.

Source: Ernst & Young analysis

The US rose a point in the Solar CSP index as its CSP market sets to surge following approvals granted for a significant number of projects, including Beacon Solar (250MW), Ivanpah Solar (392MW), Calico (664MW), Blythe Solar (1,000MW), and Genesis Solar/Imperial Valley Solar (jointly 959MW).

India increased one point, following the tender issued for 650MW of solar capacity, which officially kicks off the first 1.3GW phase of the National Solar Mission. The majority tendered relates to CSP (500MW), with the remainder allocated to solar PV.

Spain fell one point in the Solar PV index, as its PV industry faces continued uncertainty given the Government keeps postponing a final decision on the subsidy reduction levels.

In contrast, Spain's Solar CSP rose one point, as the legislation for CSP appears positive given its avoidance of retroactivity.

With the 50MW Alvarado project commissioned, Spain's installed capacity totals 432MW, surpassing the US by 10MW. Another 20 plants are under construction in Spain and 30 are permitted.

France dropped a point, given non-residential PV FITs fell by 12% on average from 1 September as the Government seeks to curb speculative investments as component prices fall.

The UK climbs two points, given the continued boom in its PV market following confirmation in the Spending Review that FITS would not be reduced at present. The Department of Energy and Climate Change (DECC) estimates the UK will have about 750,000 PV installations by 2020.

Canada rose two points in the Solar index, following the commissioning of the 80MW Sarnia PV project in Ontario, which is currently the world's largest solar facility.

Country focus – China



Investment in wind power soars

Ranking	Issue 27	Issue 26
All renewables index	1	1
Long-term wind index	1	1
Near-term wind index	1	1
Solar index	5	5

Source: Ernst & Young analysis

General

In September, a joint statement by the National Development and Reform Commission (NDRC) and State Electricity Regulatory Commission, reported that surcharges paid to low-emissions generators harnessing the wind, sun and biomass totalled CNY3.7b (€397m) in the second half of 2009, almost double the CNY2b (€214m) paid in the first half of the year, indicating a significant rise in RE installations.

It has also emerged that the cost of producing RE equipment, such as solar panels or wind turbines in China is on average 30% lower than more developed economies.

Wind

GWEC has confirmed that China now ranks as the world's largest wind power market, and is likely to surpass the US as the leader in cumulative wind power capacity by the end of the year. A recent GWEC study forecasts that current installed capacity in China could increase tenfold by 2020, up from 25GW at the end of 2009.

The growth in China's installations is underpinned by record levels of investment, which in Q3 2010 represented just under half of all funds put into new wind projects globally. It is estimated that one in two wind turbines to go on line in 2010 will be in China.

Further, this substantial investment in China's wind sector looks likely to continue, with the Government announcing it may allocate 30% of its alternative-energy spending in the next decade to wind power, totalling a potential CNY1.5t (€214b).

In September, **China Power Investment Corp.**, the country's fifth largest power generator, obtained approval to develop a 300MW wind farm in the Inner Mongolia Autonomous Region, due to come on line by 2013 and attracting a power purchase price of CNY0.52 (€0.06) per kWh once connected.

Offshore wind

China has opened bidding in the nation's first batch of offshore wind power projects under tender. The four offshore projects, located in the coastal areas of Jiangsu province with a total installed capacity of 1GW, are expected to attract a combined investment of over CNY20.8b (€2.2b).

State-owned enterprises were leading actors in the public tender, although the low prices offered indicates the winning company could lose money on the projects.

In July, China officially started transmitting power from its largest offshore wind farm. The 102MW Donghai Bridge Wind Farm off Shanghai is the first major offshore wind farm outside of Europe, and could generate up to 267GWh of power each year. The municipal government of Shanghai is also planning to build another four offshore wind farms with a combined generating capacity of 1GW.

Construction of the world's largest offshore wind farm began in late October. The 1GW wind farm will be located in Bohai Bay, approximately three hours from Beijing, and is expected to be complete by 2020. The Chinese Government has invested US\$2.2b (€1.6b) toward the project, which is being managed by the state-owned **China National Offshore Oil Corporation (CNOOC)**. The world's largest offshore wind farm is currently Thanet, in the North Sea, with a generating capacity of 300MW.

Solar

Chinese solar components manufacturer **LDK Solar** announced it has entered into a strategic financing agreement with the **China Development Bank** for up to CNY60b (€6.4b) of credit facilities over a five-year period. It is the largest loan the state-owned bank has awarded this year to the country's integrated solar product makers, according to Bloomberg.

Hanergy Holding Group, a Chinese renewable-energy company, signed an agreement with the Hainan Government to invest CNY17.5b (€1.9b) in the next five years to develop solar projects in Haikou City. The company plans to build a plant to produce 1GW of thin-film solar cells annually. Other projects include a 100MW solar power plant and a clean-energy research and development center.

Biomass

In July, the NDRC announced that it would set national FITs for biomass power plants. Currently, biomass FITs can vary between CNY0.5-CNY0.7 (€0.05-€0.07) per kWh, with central and western provinces typically gaining a lower power offtake due to poor economic development. NDRC's national tariff will fix the tariff for electricity generated from biomass projects at CNY0.75 (€0.08) per kWh across the country.

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Country focus – US



Offshore wind and CSP offer glimmer of hope

Ranking	Issue 27	Issue 26
All renewables index	2	2
Long-term wind index	3 ¹	2
Near-term wind index	2	2
Solar index	1	1

Source: Ernst & Young analysis

1. Joint

Policy

The renewables market in the US continues to be challenged by the lasting effects of the global financial crisis, which has resulted in low power prices and an uncertain policy environment. The US has dropped one point in the All renewables index, and two points in the Wind index.

The 1603 Treasury Grant is due to expire very shortly and the chances of extension are looking increasingly unlikely. The grant enables RE projects eligible for Investment Tax Credits (ITCs) to receive a Government grant equal to the value of these credits. Projects that wish to take advantage of the grant must commence construction before the end of 2010.

In September, a bipartisan group of US senators introduced a bill creating a national Renewable Electricity Standard (RES) requiring utilities to generate 15% of renewable power by 2021. A similar RES was stripped out of the broader oil spill bill in July amid claims that climate measures would not achieve sufficient Republican support. While the proposed RES bill is gaining support, it is unlikely to be passed this year.

Californian state regulators, meanwhile, have approved a requirement for utilities to generate at least one-third of their electricity supply from renewables sources by 2020, up from the current requirement of 20% by 2010.

Onshore wind

The wind sector in the US continues to be hard-hit by an unfavorable policy environment and adverse macroeconomic conditions. MAKE Consulting has lowered its forecast for wind turbine installations in the US by 23% between 2010 and 2015. It is estimated that poor market conditions have led to a 71% fall in the construction of US wind farms compared with the same period in 2009, with Bloomberg NEF predicting only 6GW of turbine installations this year compared with 9GW in 2009.

A particular issue has been the continual low natural gas prices which are bringing down the cost of gas-fired electricity. This is making it increasingly hard for wind project developers to negotiate attractive power purchase agreements with US utilities.

In the second half of 2010, the Department of Energy (DOE) announced a conditional commitment to provide a partial loan guarantee to support the world's largest wind farm to date, the 845MW Caithness Shepherds Flat project in Oregon. The US\$1.3b (€933m) project will implement 338 General Electric 2.5MW turbines, and represents the largest project to date to receive a DOE loan guarantee offer under the support of the American Recovery and Reinvestment Act.

Offshore wind

While onshore wind has been suffering in recent months, offshore wind in the US is demonstrating strong growth potential, with 5GW of planned offshore wind projects in the pipeline.

A new 350-mile (563-km) Atlantic Wind Connection is being developed to connect 6GW of offshore wind turbines between Virginia to New Jersey. This backbone transmission project is being funded by **Google** and other investors at an estimated cost of US\$5b (€3.6b).

New Jersey also recently signed a bill named New Offshore Wind Economic Development Act to develop a program of offshore renewable energy tax credits that supports 1.1GW of offshore wind installations. It is hoped that these credits will help developers secure project financing.

Solar

The US CSP market is expected to surge following approvals for a significant number of projects.

BrightSource Energy is planning to build a 392MW solar thermal plant in California based on Distributed Power Tower and heliostat mirror technology. The project should be operational in 2013 and is supported by US\$1.4b (€1b) in DOE loan guarantees. **Tessera Solar's** 664MW Calico solar plant was also recently approved. The US\$1.75b (€1.25b) installation will utilize **Stirling's** SunCatcher dish technology.

The Department of the Interior has approved the installation of the world's largest solar energy project, the 1GW Blythe Solar Power Project, which will utilize parabolic trough collector technology and is due to come on line in 2013. Other projects include **NextEra's** 250MW Beacon Solar Energy Project and the Genesis Solar Energy Project/Imperial Valley Solar Project, with a combined capacity of 959MW.

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Country focus – Germany



New energy concept and FIT cuts

Ranking	Issue 27	Issue 26
All renewables index	3 ¹	3
Long-term wind index	3 ¹	4
Near-term wind index	7 ¹	5
Solar index	7 ¹	7

Source: Ernst & Young analysis

1. Joint

Policy

On 28 September, the German Government presented its new energy plan which puts renewable energy in a central role in the future energy mix of the country. The Government wants to raise the share of renewable energy sources in power generation from the current 16% to 80% by 2050. As part of the “new energy concept,” the Government gave final approval for plans to extend the life of nuclear reactors, reversing a decision of the previous government. It insists that nuclear energy merely serves as a “bridge technology” helping the country to achieve its RE objectives; however, the decision has attracted substantial opposition.

Wind

The new energy plan includes a pledge to invest €5b via low-interest loans to help develop Germany’s offshore wind capacity. The Government estimates around €75b will need to be invested to increase capacity in offshore wind to 25GW by 2030.

In October, it was reported that Germany added 660MW of new wind capacity in the first six months of 2010, raising the country’s total to 26.4GW. Compared with installations totalling 802MW in the first half of 2009, this represents a reduction of nearly 18% and is “lower than expectations,” according to president of the German wind energy association.

The German offshore wind sector, however, received a major boost in October, with news that Sweden’s state-owned utility, **Vattenfall** will invest in excess of €1b in a huge new offshore wind farm in the North Sea. **Vattenfall** has entered into a JV with German utility **Stadtwerke München** to build the DanTysk project, which will have an estimated installed capacity of 288MW and is due to start construction in 2012.

In September, the European Investment Bank (EIB) announced it was considering a loan of up to €500m for a 288MW German offshore wind farm, to be developed by **EnBW Energie Baden-Württemberg AG** at a total cost of €1.2b.

Solar

Following the cuts in July, Germany’s solar FITs have experienced another wave of cuts in October, reducing rates by an additional 3%. Germany experienced a rush to connect projects before subsidies were reduced in July, with the country’s Federal Network Agency estimating a total PV installed capacity of 4.88GW in the year to date, with a record 3.15GW of PV capacity installed between June and August.

According to the agency, the increase in capacity makes a maximum reduction of 13% in subsidy rates for next year ‘more than likely.’ The country’s renewable energy law sets out a 9% drop in rates at the end of the year if less than 3.5GW are installed, increasing to up to 13% should capacity exceed that. It is expected that growth in Germany’s solar sector will be stunted from 2011 onwards, however.

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Country focus – India



Growing momentum in renewable space

Ranking	Issue 27	Issue 26
All renewables index	3 ¹	4
Long-term wind index	5	5
Near-term wind index	3	3 ¹
Solar index	2	2

Source: Ernst & Young analysis

1. Joint

Policy

In September, India's National Load Despatch Centre conducted a final set of trials before starting a program to issue and trade RECs. It is reported that seven states have already finalized regulations for the trading of these RECs, while nine others have prepared draft regulations, indicating that the country is one step closer to implementing its much-awaited renewable energy incentive scheme. Each REC will represent 1MWh of electricity from renewable sources, with a fixed floor price of INR12,000 (€194) for solar RECs and INR1,500 (€24) for non-solar.

Access to finance

The Indian Government is proposing to set up a green bank by utilizing part of the national clean energy fund, expected to generate INR50b (€795m) annually. The fund will be capitalized through a tax levied as a duty on the excise of domestic and imported coal. The green bank will help fund projects across wind, solar, tidal and other forms of renewable energy.

The state of Maharashtra has announced RE cost incentives in a bid to achieve its target of 3.5GW of power from renewable sources. In respect of wind power projects, the state Government will bear the cost of infrastructure development up to INR0.5m (€8,000) per MW and up to INR3.5m (€55,650) per MW in respect of power distribution costs. For biomass projects, it will reimburse the cost of power distribution up to INR40m (€635,000) per project.

Infrastructure/grid

In September, India's Central Electricity Regulatory Commission reduced the capacity required for hydropower projects and other renewable energy projects to obtain connection to the inter-state grid to 50MW. Projects with installed capacity of less than 50MW can also now seek grid connectivity collectively provided there is an aggregate installed capacity of at least 50MW.

Solar

In Q3, Indian utility **NTPC Vidyut Vyapar Nigam Ltd** issued a call for tenders for the development of 650MW of solar power capacity, marking the start of the first 1GW phase of the Jawaharlal Nehru National Solar Mission, which aims to connect 20GW of solar capacity by 2022. Most of the 650MW will be for CSP (500MW) with the remainder allocated to PV solar.

In addition to the Solar Mission, operating at a national level, various Indian states are working on independent solar policies. Since the Government of Gujarat launched its solar policy in 2009, 716MW worth of solar power projects have been allocated and Power Purchase Agreements (PPAs) have been signed with 28 companies for the procurement of 420MW of solar power.

More recently, the states of Rajasthan and Madhya Pradesh released their draft solar policies, likely to be finalized shortly. Rajasthan has one of the highest solar potentials in India, and its 2010 draft solar policy targets a solar power capacity of 10GW-12GW over the next 10-12 years.

Wind

Figures released by the Ministry of New and Renewable Energy (MNRE) indicate that India is likely to miss its new wind power capacity targets for the third year in a row. Only 205MW was installed in the first financial quarter (April-June) compared with the annual target of 2,000MW.

Diversification

India's renewable energy market is attracting the attention of a number of established companies from a diverse range of sectors, indicating a move by India's key business players to diversify into the RE sector. It is hoped that this trend highlights the attractiveness and potential of India's RE market. Besides expecting high returns from the sector, other reasons for diversification include forward integration, the reduction of corporates' carbon footprint, and derivation of synergies with existing product portfolios.

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Country focus – UK



Spending Review backs renewables

Ranking	Issue 27	Issue 26
All renewables index	5	5 ¹
Long-term wind index	2	3
Near-term wind index	4	3 ¹
Solar index	16 ¹	16

Source: Ernst & Young analysis

1. Joint

Policy

The UK Government recently announced the results of its Comprehensive Spending Review (CSR), unveiling £83b (€96.2b) of spending cuts in a bid to reduce the country's record budget deficit. Renewable energy, however, came out broadly unscathed, and even secured additional investment. The Government has pledged £2.2b (€2.5b) for clean energy projects to ensure the UK meets its target of 15% of energy from renewables by 2020. This includes £1b (€1.1b) to capitalize the Green Investment Bank, and while less than the £4-£6b (€4.6-€6.9b) called for by industry, it remains a positive sign given the current climate. Another £1b (€1.1b) will be spent on a carbon capture and storage demonstration plant, with the remaining £200m (€232m) awarded to offshore wind developments.

The CSR also left current FIT rates unchanged until the next formal review in 2012, a significant relief to the solar sector in particular, which has been significantly boosted by the recently introduced incentives. It was also announced that FITs will be refocused on the most cost-effective technologies at the next review, unless higher than expected deployment requires an early review. There is some concern, therefore, whether the solar industry will be able to compete on cost with other technologies within such a short period of time, or whether high uptake will trigger an early review leading to depression.

It was also announced in Q3 that the Government has lifted a ban, in place for the last 34 years, which prevented local authorities (LA) selling surplus renewable electricity back to the grid. Significant scope exists to install projects on local authority land and buildings, and it is hoped the removal of the ban will allow LAs to generate additional income and take full advantage of the FIT available for small-scale renewables.

Infrastructure

UK energy regulator, Ofgem, has introduced a "Revenue, Incentives, Innovation and Outputs" (RIIO) model to encourage the £32b (€37b) of investment required to update the transmission system. This upgrade is required to facilitate the UK's movement to a low-carbon economy and new sources of energy generation. The RIIO moves away from the previous inflation-tied controls to an incentive-driven approach that

rewards more efficient companies, as well as saving consumers an estimated £1b (€1.1b).

Offshore wind

The CSR included a commitment to invest £200m (€232m) in the development of offshore wind power, including a £60m (€69m) investment to upgrade British ports to make them suitable for handling large offshore turbines required for Round three projects. This is a positive sign for turbine manufacturers such as **Siemens**, **General Electric** and **Mitsubishi**, who indicated their investment in the UK was conditional on a ports upgrade. In September, it was confirmed that the UK's total installed offshore wind capacity has now reached 5GW.

The EIB has announced that it is considering a £650m (€754m) loan to help fund the 504MW Greater Gabbard offshore wind farm being developed by **RWE** and **SSE**. If it goes ahead, this will be the fifth such loan to a UK offshore facility this year alone and it is hoped that the EIB's lending will provide some confidence to commercial lenders.

Solar

The generous FIT introduced in April has resulted in a boom in the installation of small-scale renewable energy generators, especially rooftop PV. More than 25MW has been installed since April compared with a total PV installed capacity of just 32MW at the end of 2009. August saw a record 2,200 UK household installations, while DECC estimates a total of 750,000 PV installations by 2020.

Following the CSR, Solar PV tariff levels will remain at current levels through 2011-12 and will then be reduced as planned by 9%. The next formal review in 2012 will set out rates for 2013 and beyond, although this may be earlier if deployment levels remain high.

Biomass

Biomass investment in the UK is subject to further delays because the level of Government subsidies on offer for the plants is not certain until the next RO banding review. Meanwhile, the Scottish Government has proposed not to grandfather Renewables Obligation Certificates (ROCs) for dedicated biomass plants in Scotland.

Tidal

After much speculation, the Government finally confirmed in October that the proposed Severn tidal barrage, costing an estimated £30b (€34.8b), has been scrapped in favor of nuclear power.

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Country focus – France



Reduction of solar PV FIT

Ranking	Issue 27	Issue 26
All renewables index	7	7
Long-term wind index	7 ¹	7 ¹
Near-term wind index	6	6 ¹
Solar index	10	9

Source: Ernst & Young analysis

1. Joint

Policy

In August, the French Government launched a major renewable energy investment program, promising to provide €1.35b of financial support to the sector over the next four years. The program, known as “demonstrateurs energies renouvelables et chimie verte,” will allocate €450m in subsidies and €900m in loans. These funds will be targeted at emerging clean technologies that face relatively high development costs, such as solar, marine, geothermal, carbon capture and storage and biofuel development.

Solar

In August, the Ministry for the Environment, Energy, Sustainable Development and the Sea (MEEDDM) published a new Order which modifies the relatively complex PV tariff structure set out in the January 2010 Order by further reducing the applicable PV tariffs (as already amended in March 2010).

One of the purposes of the new Order is to reduce the existing solar PV FIT, by an average of approximately 12%, without modifying the eligibility criteria set forth by the January and March Orders. The decision to reduce FIT rates is supported by the findings of a report by the 'Inspection Générale des Finances,' and those of the 'Commission de Régulation de l'Energie.' A summary of the key provisions of the new Order is presented below. A careful analysis of the Order and applicable rules is further recommended when considering investments in French PV projects.

New solar PV FIT scheme

The new FITs are structured around three main tariff categories, as follows:

i. Building-integrated FIT – tariffs based on building use:

- €0.58/kWh FIT for plants with a capacity \leq 3kW located on a building used mainly for residential purposes
- €0.51/kWh FIT for (a) plants with a capacity $>$ 3kW installed on residential purpose buildings, and (b) plants with a capacity $>$ 3kW but $<$ 250kW on buildings mainly used for health or educational purposes
- €0.44/kWh that applies to other categories of buildings (e.g., office, industrial, tertiary, commercial or storage)

ii. Simplified integrated tariff of €0.37/kWh

iii. Basic tariff (where above does not apply), varying between €0.28-€0.35/kWh depending on the capacity and location

While the January Order (now repealed - see below) provided that the applicable tariff was determined by the date on which the grid connection application was filed, the August Order only states that the date of said application determines the gradual decrease coefficient (see below). Developers and Investors should pay specific attention to the determination of the FIT applicable to their projects.

It also confirms that a PV plant is eligible to receive the building-integrated FIT only if the capacity of the plants located on the same site are less than 250kW. PV plants directly or indirectly operated by the same person/entity and less than 500m apart are considered to be on the same site.

Indexation and 10% gradual reduction

The FIT indexation mechanism remains unchanged since the issue of the January and March Orders. The new tariffs should be maintained until 31 December 2011. For grid connection applications filed after that date, tariffs shall be indexed on 1 January of each year by multiplying the value of the tariff for the preceding period by the coefficient (1-D) where D = 10%.

Application time frame

The new Order is effective from 1 September 2010. While the January 2010 Order has been repealed, the purchase terms and tariffs that it set forth will still apply, upon request, for (i) projects which filed for grid connection before 1 September 2010 but cannot benefit from the 2006 tariffs, and (ii) certain other projects that meet specific criteria set forth by the August Order.

Offshore wind

The French Government should launch a call for tenders within the next few weeks, for the installation of 3GW of offshore wind capacity. It is estimated that this will involve the construction of more than 600 wind turbines, requiring an investment in excess of €10b. France's objective is to achieve a total offshore wind capacity of 6GW by 2020.

Infrastructure

The French Parliament is currently drafting a new Statute that will reorganize the power market. Among other provisions, 100% of the cost of grid connection will pass to developers (currently 60%).

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Country focus – Japan



New tariff regime boosts solar

Ranking	Issue 27	Issue 26
All renewables index	15	19
Long-term wind index	18	22
Near-term wind index	30	26
Solar index	7 ¹	10

Source: Ernst & Young analysis

1. Joint

Policy

Japan currently utilizes a Renewables Portfolio Standard (RPS) to encourage renewable energy development. The RPS was introduced in April 2003 with the aim of generating 12.2TWh per annum from renewable sources by 2010, equivalent to 1.35% of national electricity sales. In 2007, this was increased to 16TWh (1.63%) by 2014. Electricity suppliers can meet their RPS obligations via self-generation, purchasing renewable electricity from other suppliers, or purchasing a tradable REC.

In late October, the Japan Bank for International Cooperation announced it has set aside US\$4b (€2.8b) to invest in renewable energy and carbon projects in the two years through to March 2013 to help Japan offset its emissions.

Historical power tariff trends

In July this year, the Agency for Natural Resources and Energy (ANRE) updated its annual survey on power tariffs for renewable energy under the RPS Law:

Trend in weighted average power tariffs (units: JPN(€¢)/kWh)

		FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
RPS premium + electricity	Wind	11.6 (10.2)	11.0 (9.7)	10.7 (9.4)	10.4 (9.2)	10.4 (9.2)	10.1 (8.9)
	Mini-Hydro	8.5 (7.5)	8.4 (7.4)	8.4 (7.4)	7.2 (6.4)	8.9 (7.9)	8.6 (7.6)
	Biomass	7.5 (6.6)	7.6 (6.7)	7.7 (6.8)	7.8 (6.9)	8.0 (7.1)	8.7 (7.7)
RPS premium only		4.8 (4.2)	5.1 (4.5)	4.9 (4.3)	4.9 (4.3)	4.9 (4.3)	5.2 (4.6)

Source: ARNE survey, publically available info via METI website

Solar

In November 2009, the Ministry of Economy, Trade and Industry (METI) introduced a new regime for the off-take of solar electricity. Power utilities are required to purchase excess solar electricity for 10 years at a fixed tariff of JPY25 (€0.22)/kWh for non-residential and residential installations above 10kW. Residential installations below 10kW attract JPY48 (€0.42)/kWh. These tariffs are expected to be reduced gradually by installment year.

According to **Fuji Keizai**, a Japanese market research firm, these solar subsidies will help Japan's solar cell market to nearly quadruple its 2009 level to JPY487.1b (€4.3b) by 2020.

Current installed capacity

In early October 2010, ANRE published its survey on installed renewable energy capacity accredited under the RPS Law as of 31 July 2010 as follows:

Type	Number of projects	Capacity (MW)
Wind	376	2,360
Mini-hydro	479	205
Solar	92	22
Biomass	354	19,333
Geothermal	1	2
Others	33	14
Solar (off-take)	576,983	2,150
Total	578,318	24,086

Source: ARNE survey, publically available info via METI website

New regime guidelines

In August, METI published new guidelines which aim to add 32GW-35GW of RE capacity and create a renewable energy market worth JPY10t (€8.7b) by 2020. These guidelines are part of METI's broader aim to investigate a new RE incentive scheme for Japan, including a review of the scope of offtake for electricity generated from renewable sources. The guidelines include a proposed tariff of JPY15-JPY20 (€0.13-€0.17)/kWh for 15-20 years, except solar and mini-wind which are for 10 years. It is also proposed that tariffs are set higher in the earlier years, and will be reduced gradually by installment year.

In June, the Japan Wind Power Association (JWPA) published its own views on the new incentive regime to METI. The JWPA noted that the current RPS roughly equates to a 17-year off-take at JPY16 (€0.14)/kWh, however, it recommends a 20-year off-take with a JPY20-JPY24 (€0.17-€0.21)/kWh incentive in order to satisfy a minimum pre-tax project internal rate of return (IRR) requirement of 7.5%. The JPWA also recommends the establishment of a mid-term wind target capacity of 11GW by 2020.

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Country focus – South Korea



New CAI entry – overview of RE sector

Ranking	Issue 27	Issue 26
All renewables index	18 ¹	na
Long-term wind index	19 ¹	na
Near-term wind index	29	na
Solar index	12	na

Source: Ernst & Young analysis

1. Joint

Policy

South Korea aims to generate 5% of energy from renewables by 2011, increasing to 11% by 2030. This is compared with a current figure of 2.4%, therefore achievement of these targets would more than double energy from renewables by the end of next year.

South Korea already has FITs in place for wind and solar power; however, from 2012 these will be replaced by a Renewable Portfolio Standard (RPS), approved by the South Korean Assembly in March 2010. This RPS will require 14 state-run and private power utilities with capacity in excess of 500MW to generate 4% of energy from renewable sources by 2015, increasing to 10% by 2022. This program, which will become effective in 2012, will mandate 350MW/year of additional RE to 2016, and 700MW/year to 2022.

South Korea's Government has announced that a total KRW40t (€25.8b) will be invested in RE by 2015. This includes KRW22.4t (€14.4b) to be invested by the nation's 30 largest industrial groups by 2013. The Government will contribute approximately KRW7t (€4.5b) and the remaining KRW10.6t (€6.8b) coming from other areas of the private sector. South Korea has already seen substantial financial investment in RE in recent years, including KRW2t (€1.3b) from Government in the last two years.

Further, all RE technologies receive a 5% tax credit, and in 2009, import duties were halved on all components/equipment used in RE power plants. The Government also provides subsidies to local governments of up to 60% for the installation of renewable facilities, as well as offering low interest loans (5.5%-7.5%) to RE projects, including a 5-year grace period followed by a 10-year repayment period.

Wind

Wind power is currently supported through a FIT of KRW107.29 (€0.07)/kWh, decreasing annually by 2% from October 2009. However, this FIT will be replaced by the RPS from 2012 onwards. It is estimated that South Korea has potential reserves of 186.5TWh per annum. The current installed capacity is around 348MW and there is a substantial project pipeline

including **Hyundai Heavy Industries'** 200MW wind farm due to be operational by 2012 and costing KRW500b (€322m).

The country has also seen investment by turbine manufacturers in a bid to develop a strong domestic supply chain. **Samsung** has already started operations, with scope to produce turbines with 500MW per year in generation capacity.

Offshore wind

South Korea aims to be the world's third largest offshore wind power generator. At the end of Q3, it was announced that the country will launch a KRW9.2t (€5.9b) offshore wind farm project in the Yellow Sea. An initial testing phase will install 20 5MW turbines by 2013, but the site will have an estimated generating capacity of 2.5GW by 2019 and it is reported that domestic companies will build the 500 turbines required.

Solar

Solar FITs were first adopted in 2006 and were considered to be quite generous. A decision was made in 2008, however, to reduce the rate by up to 30% as a way of encouraging local production. Rates now range from KRW572 (€0.37)/kWh for systems smaller than 30kW to KRW509 (€0.33)/kWh for those larger than 1MW capacity.

As with wind, the solar FIT scheme will be replaced in 2012. In addition to the RPS enforcement, utility companies will be given a separate solar energy production quota of 120MW in the first year, gradually increasing to 200MW in 10 years, after the rules are enacted.

Grid-connected solar PV totalled 430MW at the end of 2009, including **Samsung's** 18.4MW plant and **Conergy's** 19.6MW plant (reported to be Asia's largest in 2008). The European PhotoVoltaic Industry Association (EPIA) has estimated the country's solar PV market could grow to 1.3GW by 2013, and the current pipeline includes **SunEdison's** 400MW of solar plants to be built across the country,

Hydro

It has been estimated that South Korea has a small-scale hydro potential of up to 1.5GW, and that 198MW could be generated by 2012. Installed capacity represents less than 5% of the domestic potential, indicating significant untapped resources. The project pipeline includes five small hydro plants as part of the Four Rivers Project.

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Country focus – Romania



New CAI entry – overview of RE sector

Ranking	Issue 27	Issue 26
All renewables index	22 ¹	na
Long-term wind index	24	na
Near-term wind index	18 ¹	na
Solar index	22 ¹	na

Source: Ernst & Young analysis

1. Joint

Policy

In line with EU requirements to develop E-RES (electricity from renewable energy sources) production capacities, Romania has set itself an ambitious target to generate 33% of total electricity consumption from renewable sources by the end of 2010, increasing to 38% by 2020.

Romania has operated a tradable green certificate (GC) system since 2005, requiring power suppliers to purchase GCs equivalent to the portion of renewables in the total supply mix, subject to a minimum quota of 6.28% (2009). All technologies are awarded 1 GC per MWh, with the GC price allowed to fluctuate between €27-€55. Historically, GCs have traded at upper limits given the low level of renewable energy produced.

In 2008, the Romanian Government passed Law 220, which differentiates between technologies by offering 2-4 GCs/MWh. In June 2010, the RES Law was revised (139/2010), with the most significant change being the increase in the number of GCs offered to solar, from 4 to 6 GCs. However, while both laws have been enacted, neither can yet be applied since they remain under review by the EU Commission, and the Secondary Regulations required to apply the laws cannot be released until EU approval is received. The reasons for delay are not clear.

Romania's renewable market has seen significant developments since 2008 and many of the best wind locations have already been secured by key industry firms such as **CEZ**, **Iberdrola** and **RWE**. However, uncertainty over the stalled legislation continues to be an obstacle for investment in major renewables projects, therefore it is hoped that this much-awaited legislation will be applied in the near future since it will introduce extremely favorable incentives for potential RE investors. However, the country will also need to overcome the challenges of a bureaucratic authorization process and of a transportation system in need of development.

Wind

Romania is considered to have some of the best wind conditions in Europe, with an estimated annual potential of 23TWh. Under Law 220/2010, energy producers will receive 2 GCs/MWh up to 2018 and 1 GC thereafter for a total of 15 years.

Despite an installed capacity of only 14MW at the end of 2009, the Romanian Wind Energy Association (AREE) aims to achieve a total 650MW by the end of the year, with potential to increase this to 5GW by 2020.

CEZ's €1.1b Fantanele-Cogealac project is key to achieving this target. Poised to be Europe's largest wind complex with a capacity of 600MW when fully commissioned, the first few dozen turbines have already been connected to the grid. Earlier this year, **Iberdrola** was granted a licence to connect up to 1.5GW to the network, while many other key players such as **Enel**, **Energias de Portugal**, **RWE**, and **Verbund** are already establishing a project pipeline in excess of 1GW.

While access to the Black Sea provides Romania with some offshore wind potential, existing projects such as Fantanele are already located near the coast, therefore grid congestion issues may delay large-scale offshore developments.

Solar

Despite a strong annual solar energy flux of 1,000-1,300 kWh/m²/year and a potential generating capacity of 1.2TWh per annum, Romania's installed capacity to date is less than 500kW. It is hoped that the decision to award 6 GCs per MWh for solar PV generated power under Law 139 will stimulate investment in the sector. The country is already seeing increased investment by solar panel producers, creating the foundations of a strong domestic supply chain.

Hydro

Romania's small-scale hydro potential is estimated to be 3.6TWh, with a current installed capacity of approximately 374MW at the end of 2009. The country's hydro potential is significantly higher when large-scale projects are taken into account; however, it is hoped that the incentive of 3GCs/MWh for hydro facilities less than 10MW under Law 220 shifts investor's focus toward small-scale hydro developments.

Biomass and geothermal

Romania has significant biomass and geothermal resources; however, both are primarily used for heating rather than electricity generation. Law 220 offers 3GC/MWh to both technologies, which may increase investment going forward.

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Country focus – Egypt



New CAI entry – overview of RE sector

Ranking	Issue 27	Issue 26
All renewables index	22 ¹	na
Long-term wind index	25	na
Near-term wind index	21 ¹	na
Solar index	14	na

Source: Ernst & Young analysis

1. Joint

Policy

In February 2008, the Government announced its ambitious goal to generate 20% of the country's energy production from renewable resources by 2020, equivalent to around 7GW of electricity. Wind will represent c.12% and hydro/solar PV will contribute 8%.

The Ministry of Electricity and Energy holds a monopoly over the distribution, transmission and generation of electricity in the country. Currently, the Government subsidizes electricity for its population of almost 80m, 40% of which live below the poverty line. However, this introduces a risk that energy generated by renewable sources could be considered much too costly to compete with oil and gas given the significant upfront investment required to develop an RE infrastructure.

The Government, however, appears committed to achieving its target and has proposed a New Electricity Act which is currently under consideration. It is hoped the law would encourage private sector participation in the energy market via a FIT system similar to Germany's.

It is likely any boost in energy from renewable sources will be well accommodated by the Egyptian national grid, which is extensive and provides over 99% of the population with modern electricity services. Furthermore, grid-connected RE projects currently enjoy priority in dispatching and Egypt's central bank guarantees all financial obligations of the **Egyptian Electricity Transmission Co.** under the PPA.

Wind

According to the World Bank, Egypt has some of the world's best wind power resources, especially in the Gulf of Suez area where an estimated 7.2GW could be developed by 2022, with additional significant potential on the east and west banks of the River Nile. It is estimated that average wind speeds in the Gulf of Suez reach 10m/s.

Egypt had an installed wind capacity of 430MW at the end of 2009. The country's largest wind project to date is a US\$490m (€352m) development in the Gulf of el Zayt, commissioned in 2009 with a generating capacity of 200MW.

Egypt has also received some financial support from the Japanese Government toward the expansion of its wind

sector, specifically a JPY38.9b (€344m) loan to help finance a 220MW wind farm, also in the Gulf of el Zayt area. Another 250MW wind farm in the Gulf of Suez is expected to come on line by the end of 2013, with 10 local and foreign companies already shortlisted for the scheme.

The Government has earmarked 7,600km² of desert land for implementing future wind energy projects, for which all land allocation permits have already been obtained by the New and Renewable Energy Authority (NREA).

Solar

Egypt is located in the "Sunbelt" area and is endowed with high intensity solar radiation ranging between 2000-2600 kwh/m² per annum, with a daily sunshine duration of 9-11 hours. The potential for solar increases is improved further given the country's vast desert land, making it suitable for CSP development. It is estimated that at least 1GW of solar capacity will be required by 2020, if the country is to meet its RE target while satisfying the growing demand for power.

To date, uptake of solar projects has been slow due to high capital costs, with only 6MW of solar PV currently installed and CSP of 30MW as part of a 150MW hybrid power plant. While the cost of solar technology is expected to decline in the next five to seven years, Egypt has no clear strategy to exploit its abundant solar resources, although the Egyptian Government is attempting to stimulate investment in solar by offering free land to potential investors.

In October 2010, the World Bank announced a US\$270m (€194m) loan to the Egyptian Electricity Ministry to build a 100MW solar plant in the south of the country, to be constructed between 2012-17 and costing an estimated US\$700m (€503m).

Hydro

Egypt has substantial hydropower resource which is exploited by both large- and small-scale developments. The country has a strong portfolio of small-scale hydro facilities and an impressive pipeline of projects planned or already under construction.

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Country focus – Mexico



New CAI entry – overview of RE sector

Ranking	Issue 27	Issue 26
All renewables index	25 ¹	na
Long-term wind index	26 ¹	na
Near-term wind index	26 ¹	na
Solar index	13	na

Source: Ernst & Young analysis

1. Joint

Policy

Energy efficiency and renewable energy development are priority commitments for the Mexican Administration. The Government aims to generate 25% of total energy consumption from renewable sources by year 2012, increasing to 35% by 2024.

The Federal Commission of Electricity (CFE) has issued a 15-year energy plan called “The 2010-2024 Program for Works and Investments in the Electric Sector” (“POISE” in Spanish). This report estimates that 38GW of additional installed capacity will be required over the course of its 15-year plan just to cover public service needs.

While there are currently no formal power-offtake support mechanisms in place, the Government is continuing to demonstrate its commitment to RE through the construction of a specific regulatory framework. Further, multilateral agencies such as the World Bank or Inter-American Development Bank, have expressed interest in supporting the financing of RE projects in the country.

Wind

Mexico benefits from excellent wind conditions and there exists significant potential for a strong wind power sector. Oaxaca is a particularly windy region in Southern Mexico, with average capacity factors above 40% according to GWEC.

Mexico looking to install up to 3GW by 2014, six times more than the 500MW currently on line. The Ministry of Energy predicts up to 40GW could be developed in total and it is hoped that by 2024, wind power developments will represent 3.1% of total power generation, compared with 0.2% in 2008.

Despite this significant potential, wind development been slow to date due to the lack of adequate financial incentives and issues with the existing regulatory framework; however, it is hoped laws and regulations published in 2009 will boost investment in alternative energy generation.

The country is starting to attract investment from some of Spain's largest energy companies such as **Iberdrola**, **Acciona** and **Gamesa**. The 2GW Oaxaca complex is set to come on line in around three years' time and there are a number of other

projects in planning or construction phases, although mainly for self-generation at present.

Solar

Solar resource in Mexico is almost endless, with gross solar potential estimated to be 2000kWh/m² each year, corresponding to 50 times national electricity generation. It is estimated that Mexico's average solar PV resources are more than 60% higher than the best solar conditions in Europe, and that the country ranks third in the world in respect of its solar potential.

An Inter-American Development Bank study in 2009 estimates PV and solar thermal potential to be 45GW, although the solar thermal element is likely to be used for heating rather than electricity generation.

To date, however, Mexico's strong solar resources have largely gone untapped due to high costs, with PV installations primarily providing off-grid generation for remote rural areas. Economic and financial potential is limited to specific niches, with only 19.4MW installed capacity at the end of 2009 according to Mexico's solar energy association, ANES.

Mexico's CSP potential is also strong, and testing/demonstration projects have already been initiated in the country. Further, the CFE is currently overseeing a bidding process to grant a contract for the construction of a 12MW-15MW facility as part of the Agua Prieta II project in Sonora State.

Geothermal

At the end of 2009, Mexico had 965MW of installed geothermal capacity and total energy production was 7.1TWh, representing 3.24% of the total electricity generated in the country. It is estimated that there is a potential for an additional 500MW of geothermal capacity from the development of new zones and the extension of existing fields. CFE have already planned projects for 2009-24 to add approximately 316MW across the existing fields.

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Commentary – guidance notes

Long-term index

As stated on page 1, the individual technology indices, which combine to generate the all renewables index, are made up as follows:

- ▶ Renewables infrastructure index – 35%
- ▶ Technology factors – 65%

These guidance notes provide further details on the renewables infrastructure index and the technology factors.

Renewables infrastructure index

The renewables infrastructure index is an assessment by country of the general regulatory infrastructure for renewable energy. On a weighted basis, the index considers:

- ▶ Electricity market regulatory risk (29%) – markets that are fully deregulated score higher, as they have experienced the “market shock” on underlying wholesale prices that this transition may exert. While this may not affect current projects, these effects are particularly important when considering long-term investment prospects.
- ▶ Planning and grid connection issues (42%) – favorable planning environments (low failure rates and strong adherence to national targets) score highly. Grid connection scoring is based on the ease of obtaining a grid connection in a cost-effective manner. The score also takes account of the degree of grid saturation for intermittent technologies.
- ▶ Access to finance (29%) – a market with a mature renewable energy financing environment, characterized by cheap access to equity and good lending terms, will score higher.

This generic renewables infrastructure index is combined with each set of technology factors to provide the individual technology indices.

Technology factors

These comprise six indices providing resource-specific assessments for each country, namely:

1. Onshore wind index
2. Offshore wind index
3. Solar PV index
4. Solar CSP index
5. Geothermal index
6. Biomass and other resources index

Other renewable energy resources include small hydro, landfill gas, and wave and tidal technologies. Energy from waste is not considered. Each of the indices consider, on a weighted basis, the following:

1. Power offtake attractiveness (19%) – this includes the price received, the potential price variation and length of PPAs granted. Higher scores are also achievable if a government guarantees the power offtake rather than merchant offtakers.
2. Tax climate (11%) – favorable, high-scoring tax climates that stimulate renewable energy generation can exist in a variety of forms and structures. The most successful incentives and structures have been direct renewable energy tax breaks or brown energy penalties, accelerated tax depreciation on renewable energy assets and tax-efficient equity investment vehicles for individuals.
3. Grant/soft loan availability (9%) – grants can be available at local, regional, national and international levels, and may depend on the maturity of a technology as well as the geographical location of the generating capacity. Soft loans have historically been used in pioneering countries of renewable energy technologies to kick-start the industry. High scores are achieved through an array of grants and soft loans.
4. Market growth potential (18.5%) – this considers current capacity compared with published targets. Higher scores are given if ambitious targets have been set and policy framework is in place to accelerate development. The realism of targets is taken into account as well as the seriousness with which they are being pursued (e.g., penalties in place for non-compliance).
5. Current installed base (8%) – high installed bases demonstrate that the country has an established infrastructure and supply chain in place, which will facilitate continued growth and, in particular, encourage the repowering of older projects.
6. Resource quality (19%) – for example, wind speeds and solar intensity.
7. Project size (15.5%) – large projects provide economies of scale and a generally favorable planning environment, which facilitates project development financing.

Commentary – guidance notes

Near-term wind index

As stated on page 1, the near-term wind index focuses on factors of most immediate concern to near-term investment in wind energy. The scoring follows the same methodology as for the long-term wind index, but with a more focused set of parameters and a tailored weighting. Therefore, the indices consider the following, on a weighted basis, for both onshore and offshore wind separately:

- ▶ Power offtake attractiveness – 27%
- ▶ Tax climate – 8%
- ▶ Resource quality – 14%
- ▶ Market growth potential (next two years) – 40%
- ▶ Project size – 11%

In the offshore near-term wind index, countries with no projects estimated to reach construction in the next two years are excluded.

It should be noted that the market growth potential score is based on a view taken of a range of business analysts' forecasts and Ernst & Young's own market knowledge. There is significant variation between analysts' views on each market, and within some markets, the variation is greater than in others. The forecasts used are a market view only and the scores in no way guarantee that the forecasted capacity will be built.

While comparisons have been made between scores in the long-term and near-term wind indices, it should be emphasized that, due to the different weightings and parameters used, these cross-comparisons are of a narrative nature only and by no means indicate any quantitative valuation.

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Glossary

Abbreviation	Definition
ANES	Mexican National Association of Solar
ANRE	Agency for Natural Resources and Energy
AREE	Romanian Wind Energy Association
b	Billion
BRIC	Brazil, Russia, India and China
CAI	Country Attractiveness Indices
CCX	Chicago Climate Exchange
CER	Certified Emission Reduction
CERC	Central Electricity Regulatory Commission
CFE	Federal Commission of Electricity
CHP	Combined heat and power
CO ₂	Carbon dioxide
CSP	Concentrated solar power
CSR	Comprehensive Spending Review
DECC	Department of Energy and Climate Change
DOE	Department of Energy
EIB	European Investment Bank
EMEA	Europe, Middle East and Africa
EPIA	European PhotoVoltaic Industry Association
E-RES	Electricity from renewable energy sources
ETS	Emission Trading Scheme
EU	European Union
EUA	EU emission allowance
FIT	Feed-in tariff
GC	Green certificate
GW	Gigawatt
GWEC	Global Wind Energy Council
IEA	International Energy Agency
IPO	Initial public offering
IREDA	Indian Renewable Energy Development Agency
IRR	Internal rate of return
ITC	Investment Tax Credits
JWPA	Japan Wind Power Association
kW/kWh	Kilowatt/Kilowatt hour
LA	Local authorities
m	Million
m/s	Meters per second
M&A	Mergers and acquisitions
MEEDDM	Ministry for the Environment, Energy, Sustainable Development and the Sea
MENA	Middle East and North Africa
METI	Ministry of Economy, Trade and Industry
MNRE	Ministry of New and Renewable Energy
MW/MWh	Megawatt/Megawatt hour
NDRC	National Development and Reform Commission
NREA	New and Renewable Energy Authority
NSM	National Solar Mission
NTPC	National Thermal Power Corporation
POISE	Program for Works and Investments in the Electric Sector
PPA	Power purchase agreement
PV	Photovoltaic
RE	Renewable Energy
REC	Renewable Energy Certificates
REITS	Real estate investment trusts

Abbreviation	Definition
RES	Renewable Electricity Standard
RIO	Revenue, Incentives, Innovation and Outputs
RO	Renewables Obligation
ROC	Renewables Obligation Certificate
RPO	Renewable Purchase Obligation
RPS	Renewables Portfolio Standard
t	Trillion
TWh	Terrawatt hour

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