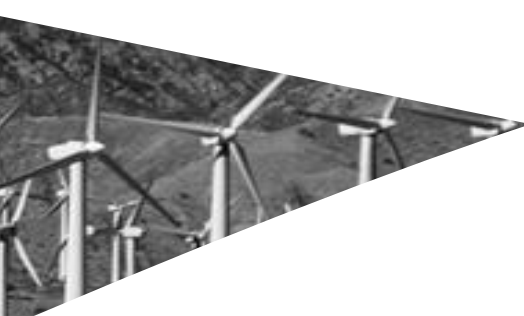


Renewable energy country attractiveness indices



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Global highlights

It has been a tumultuous few months for the world's renewables markets. The unrest in the Middle East and North Africa has cast the spotlight once again on the importance of security of energy supply and volatility of oil prices, while the Japanese tsunami and nuclear disaster have prompted some governments to elevate renewable energy ambitions.

Meanwhile, government budget cuts and reductions in feed-in tariffs (FIT) across Europe are causing cell prices to fall - and yet rising silicon (and other commodity) costs are squeezing solar manufacturers' margins. The lead article reflects on these dramatic events and discusses their impact more specifically on solar markets.

China has climbed to its highest ever score in the All renewables index, reaching the level the US held in Q3 2007. This is principally due to China diversifying its renewables portfolio through an increased focus on offshore wind and CSP. This broadening scope as new technologies become commercially viable illustrates a key trend. Examples featured in this issue include offshore wind in Taiwan, UK and the Nordics, with CSP in Morocco, US and India.

The US remains in second position. Although President Obama has voiced his support for renewable energy, significant Republican opposition in Congress is causing a stalemate. Utility scale solar projects currently appear to be immune to this uncertainty, but lack of liquidity in power offtake arrangements remain the major barrier to new utility scale wind projects, particularly in light of the continued suppression of gas prices in the US.

Apart from Brazil, which, propelled by strong growth in its wind market, has risen four places to 12th position, most countries in the top 20 have dropped slightly in scores - largely as a result of diminishing incentives and restricted access to capital. Our special feature article emphasizes the epic scale of funding required to achieve global renewable energy ambitions.

The lower half of the CAI table reveals several climbers and four new entrants, as the index expands to 35 countries. Morocco jumps straight in at number 27, on the back of strong solar and wind resources, and large increases in demand. Taiwan's solar supply chain and offshore wind potential are attractive for investment, while Bulgaria's and Chile's natural resources are being hindered in the short term by policy barriers.

In this issue we are privileged to share exclusive interviews with **Goldwind's** Vice President and **Suzlon China's** CEO - providing their insights on the booming Chinese wind market. We also have a special regional focus on the Nordics - Norway, Sweden, Denmark, and Finland - with their abundance of natural resources and potential to generate renewable power for other European countries.

Ernst & Young was ranked the leading project finance advisor in the Americas, Europe, Middle East and Africa between 2001 and 2010 by *Project Finance International*



Overview of indices: Issue 29

The Ernst & Young country attractiveness indices (CAI) 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 quarterly basis.

The CAI take a generic view, and different sponsor or 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 page 31 referring to the indices.

Long-term indices

The long-term indices are forward-looking and take a long-term view (up to five years), 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, its score is 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 – 65%
(comprising onshore wind index and offshore wind index)
2. Solar index – 18%
(comprising solar photovoltaic (PV) index and concentrated solar power (CSP) index)
3. Biomass and other resources 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 31).

Technology factors

These provide resource-specific assessments for each country.

Long-term wind index

This index is derived from scoring:

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

Long-term solar index

This index is derived from scoring:

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

For parameters and weightings see page 31.

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.

Please visit our websites www.ey.com/renewables or www.ey.com/CAI or contact either:

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Enquiries to the guest columnist should be addressed to mtoy@uk.ey.com

The best way to access historical information in Bloomberg is from Ernst & Young Renewable Energy - Total Renewable CAI page: {EYRE<GO>}. Each value can be evaluated to reveal history.

Solar incentive reductions and oversupply: softened by world events?

Guest columnists – John M. de Yonge and Thomas Christiansen, Ernst & Young

The impact of recent world events, especially the devastating tsunami in northern Japan and political unrest in the Middle East and North Africa (MENA) region, can often be felt well beyond the point of direct impact – a change in environment felt in one part of the world can cause a shift in attitudes on the macro level. This appears to be holding true of the Japan and MENA crises, which are causing a reconsideration of the optimal energy mix at the national level and the role of renewable energy in generating electricity. As a result, the solar industry may experience an easing of some of the structural issues it currently faces.

The direct and indirect impacts of a magnitude 9.0 earthquake

On 11 March 2011, 14:46 JST, a magnitude 9.0 earthquake strikes off the northeast coast of Japan causing a deadly tsunami. With tens of thousands dead or missing and villages destroyed, this massive natural disaster will cause hardship for residents of the region for years to come.

And there was more: the awesome power of nature overcame the defensive barriers put in place to protect nuclear power facilities in Fukushima Prefecture, resulting in significant damage to the reactor housing and core, which then released radioactivity. According to media reports, the situation has improved but not stabilized.

Political turmoil in the MENA region contributes to uncertainty

A significant portion of the world's current energy needs are met through petroleum resources found in the MENA region. With the recent uptick of political unrest and military action in the region, there is an air of uncertainty in world markets concerning the availability of petroleum. The underlying volatility has generated business risk as well as the potential for supply interruptions that could raise long-term prices. While the link between solar and oil is less direct than between solar and nuclear – oil is used primarily as transportation fuel rather than for electricity generation like nuclear power – the energy security concerns raised by MENA instability have helped to energize a broader push for renewables, including solar.

Prior to these world events, the policy news in Europe had been very bad for PV companies. The PV sector experienced a bad start to 2011 on the policy front. Given significant political and popular pressure, January witnessed large voluntary concessions by the PV industry in Germany. In 2010, the industry had launched a strong lobby campaign, which had reduced and stretched the planned reductions, but could not prevent a large portion of the ground-mounted market from no longer receiving FIT support. Meanwhile, the cost of FITs for solar had come under further scrutiny. Many commentators noted that PV absorbed a large proportion of FITs' total cost while providing only a small amount of FIT-supported electricity generation in 2010. Indeed the German PV market had an exceptional year in 2010, with 95%

growth in installations, manageable price declines and a 44% share of world installations. In order to prevent a hard cap or other more drastic measures, the industry voluntarily agreed in January to market-based, flexible reductions to take effect on 1 July 2011. Once implemented, this will be the fifth reduction in FITs in 18 months. The prior four cuts had already reduced the total FIT by about a third.

Italy, the second-largest market, surprised even the most optimistic industry analysts when it revealed in January that there had been 4.5 GW of installations in 2010. These numbers and the potential cost shook Italian policy makers into action. For much of Q1 of this year, there was lively discussion of cuts in PV incentives. On 5 May 2011, the Italian Government approved a new decree for PV incentives called "Fourth Conto Energia," which will significantly reduce FITs, starting from June 2011. There will be monthly reductions from June to December 2011. Then, from 2012 to 2013, the reductions will take effect twice a year. Thereafter, a new mechanism will be introduced.

The Czech Republic, with 1.5 GW and 274% growth in installations in 2010, dramatically decreased the incentive rates late in 2010, all but ensuring that the market will collapse in 2011. In addition, the Czech Republic passed retroactive taxes on PV companies in an apparent attempt to claw back what it views as excessive returns on previously installed systems. France, Europe's fourth-largest market, introduced a three-month moratorium late in 2010, which was followed by a market cap being announced in early 2011. The UK, deemed a promising PV market in 2010, announced an early review of PV feed-in tariffs, leading to cuts of up to 72% from August for installations larger than 50 kW. Turkey, a market the industry had been looking to because of strongly growing energy needs and high levels of solar resources, announced first-time incentives at a level that were disappointing to the industry.

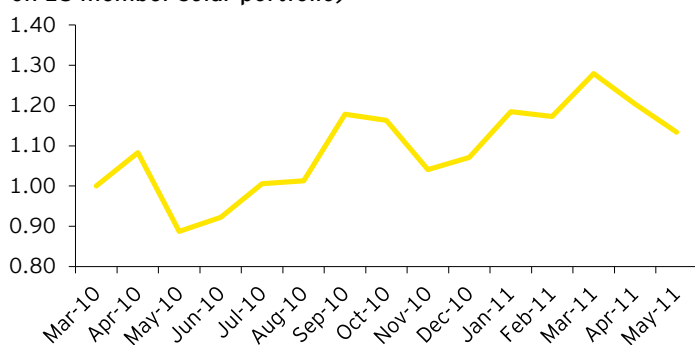
So from a policy perspective, 2011 was quickly shaping up to be an "annus horribilis" for the global PV industry, after 130% installation growth in 2010. Many of the brighter spots in the industry were outside of Europe, most notably the US, China and India. However, since non-European markets account for only 20% of global demand, their growth would not yet offset weakness or stagnation in Europe.

From the viewpoint of European manufacturers, the bad news did not stop here. Global production capacity is estimated to have increased 87% in 2010. Based on expansion plans, capacity should increase a further 80% in 2011, with much of the new capacity being added in Asia. As these capacities come online, greater oversupply will develop. Significantly more modules could make their way to Europe, squeezing higher-cost producers first.

A disaster changing the energy world

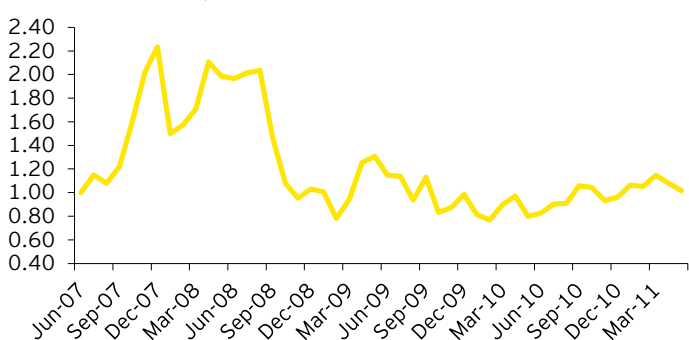
After the nuclear disaster in Japan, solar valuations quickly shot up. Most of these gains have since reversed to losses. In markets, it seems the short term has caught up with the long term again.

Figure 1: Short term solar share price relative values (based on 15 member solar portfolio)



Source: Ernst & Young analysis

Figure 2: Long term solar share price relative values (based on 15 member solar portfolio)



Source: Ernst & Young analysis

But the long term matters. The outcome of the nuclear disaster continues to disturb many people in the world. Acceptance of nuclear power is waning, and any future build is likely to be more expensive and take more time to complete. More coal-fired power as a response does not seem palatable in many OECD countries. Even coal plants with carbon capture and storage (CCS) are meeting resistance in some areas. Gas-fired plants, on the other hand, do seem compatible with intermittent renewables and carry a much smaller carbon penalty.

Although it appears that more renewables are currently the preferred choice for voters and policy makers, there is a spectrum of opinion. In China, some nuclear power stations have suspended operations and the Government has stopped all nuclear project approvals. But in the US, nuclear power, natural gas and coal plants with CCS are still being promoted, with renewables in the Clean Energy Standard (CES) currently being considered by Congress. In the UK, a new study by the Committee on Climate Change has shown that Britain might need to build two more nuclear reactors within 20 years in order to be able to achieve its carbon reduction goals at an acceptable cost, and in March, the UK budget supported nuclear power through a new carbon floor

"The nuclear disaster in Japan is changing the energy world," says Gerhard Stryi-Hipp, Head of Energy Policy at the Fraunhofer Institute for Solar Energy Systems. He adds, "Some countries, France or perhaps the US, for example, will need a bit of time to discuss which alternatives are available. But I cannot imagine the people again accepting a government policy which says that the solution to our energy problems is nuclear power."

Nathaniel Bullard, Lead Analyst, North American Solar, Bloomberg New Energy Finance (BNEF), agrees: "Broadly speaking, in the short term, none of this has an immediate impact on the sector. Longer term, certainly within Europe and maybe within the US and other countries, you're seeing a macro trend toward more solar energy. China has said that it is putting in a bit of a pause in its nuclear plans and intends to double solar installations in the next five-year plan."

Countries develop a mix of energy plans to fit environmental and political preferences. Historically, this has included abundant fossil fuel sources, but this is changing rapidly. "We're seeing interesting growing pains," says Ernst & Young LLP Energy and Environmental Infrastructure Leader Ben Warren. "In the short term, policy makers are focusing on cost-effectiveness of renewables - this is penalizing solar energy versus other technologies such as onshore wind. In the longer term, the events in Japan will help move solar out of a niche technology corner and into the mainstream of power generation technologies."

Investors seek to reduce country risk in their energy portfolios

Markets typically attract investment capital to areas that minimize risk and maximize return. "Investors want to know that if they invest in a wind farm or a solar park, the investment is secure and they can be sure that the system will be profitable," says Stryi-Hipp. "In developed markets, such as Germany, there is a great deal of experience in financing renewable systems, coupled with strong trust that the Government will not reduce feed-in tariffs for systems that are already installed. So, there is no doubt that the investments already completed and systems already installed will receive their feed-in tariffs over the next 20 years."

Stryi-Hipp adds that "in Italy, it has not been a problem so far. Many international investors are providing capital, and the Government has a commitment not to change the feed-in tariffs for installed systems. However, in some countries, such as the Czech Republic, an additional tax has been placed on the feed-in tariff, while a cap on tariff revenue has been decreed in Spain."

BNEF's Bullard comments that "the threat of possible retroactivity is a terrible sign for investors. This tends to make people very, very cautious. So, you certainly see that all of the investors who are in any of these markets watch extremely closely to see what the experts are saying about whether or not this is going to happen."

Bullard notes that “interventions never create stability. By their nature, they are instruments of instability because they are put in to disrupt the system that was already in place. Stable policies are better than good policies, in the sense that they provide a long-term framework on which to make an investment case – and then to invest with the highest possible expectation that your returns profile won’t change.”

“Stability plays a huge role in maintaining a long-term growth trajectory in renewable energy,” adds Bullard. “Particularly in solar, the economics improve as the devices improve. We have forward cost curves for equipment that run out all the way until the end of this decade. And the long-term trend on power prices is that they go up, principally due to shortages of supply and a higher cost base. But solar, at least on a cost basis, continues to decline as markets get larger and larger and people get more and more experienced with the technology. We tend to see that the equipment gets less expensive, and therefore it can become more competitive. Basically, if the policies are stable, the market will make itself more competitive or the equipment will make itself more competitive.”

Cost is also an issue

Markets seek the most cost-effective solution. Stryi-Hipp sees a variety of trends in different markets:

“Worldwide, PV demand is not growing as fast as production, and I would expect that we will see strong oversupply in the world market, which will lead to increased competition between companies. So the module price will quickly decrease to a level where it is more attractive to invest.

“In some countries, the situation is more difficult. We see an element of uncertainty in Italy. It’s clear that Italy appears to be a perfect market for PV. The country has high electricity prices, it has high solar exposure, and it doesn’t have much fossil fuel resource. It’s clear that it wants to have PV power on the grid and it has a goal to install three gigawatts in three years. However, the market was much larger than expected last year, and so the Government has reacted with further FIT reductions in the new “Fourth Conto Energia” decree.

“France has a problem in that it depends on nuclear power. Up to now, it has not been ready to discuss fading out the nuclear plants, but it’s clear the discussion will increase as will complaints about the dependence on nuclear power. So, France will look to alternatives and will slowly increase renewables, including PV.

“In other parts of Europe and in other countries of the world, the readiness to install PV is growing. The main problem we have is that this readiness is growing more slowly than production, which leads to an oversupply that brings the sector and industry under pressure. There’s strong competition between Europe and Asia on production capacities – competition that will increase in the near future.”

Says Ernst & Young LLP’s Warren, “We are entering a period of uncertainty.” Warren notes that the history of generous support for solar, combined with abundant investment in manufacturing,

has reduced solar PV prices and increased competition. However, current reductions in government support may lead to reduced demand and increased overcapacity. Or it is possible that further reductions in panel prices will keep demand levels up. “Grid parity” with fossil fuels in the future is sure – but the length of the journey leading there is uncertain.

Short-term pain followed by sustained recovery

Recent policy maker actions regarding PV energy production in various European countries can be classified into three categories: 1) reduction in incentives per unit of power, 2) a cap for capacity per year, and 3) a delay for PV capacity building until a later time. In parallel, these policies could, if many nuclear or coal power stations are decommissioned, lead to electricity deficits. This is focusing minds on cost-effective “workhorse” renewable technologies, especially onshore wind. In many recent pronouncements by policy makers or scientific bodies advising them, wind energy has been recommended as a cost-effective way to rapidly increase the share of renewable electricity.

The nuclear disaster in Japan and events in the MENA area will not save the PV industry from short-term pain. European producers that are not at scale will face stiff competition from Asia. Tier 1 players will benefit as customers again have the luxury of migrating to brand name providers with stronger balance sheets. As prices for crystalline products fall, thin film technology will have to lead price declines due to higher balance-of-system costs, putting even more pressure on emerging thin film producers. Project developers will see weakness in demand, coupled with increasing supply options and lower cost components.

To compensate for the loss of markets in Europe, the industry will have to quickly internationalize its sales and project development networks. This will come at an extremely untimely period of high strain due to lower returns in established markets. Firms will require strong balance sheets, a good handle on working capital, and access to sources of capital to expand their footprint in this period.

In the medium term, as the solar industry continues with price adjustments – down its steep experience curve – it will reach price points compatible with other renewable technologies. Consumers will not have to be convinced. Price parity with other technologies will remove the concerns and leave policy makers at ease with the cost of PV. Primed by events in Japan and the Middle East, and supported by climate concerns, PVs will then enter a new phase of growth to become a major part of the overall energy supply.

Ernst & Young LLP recently published an illustration of the solar value chain, providing an overview of key companies active in the industry in each major component or service category. It covers crystalline and thin film technologies, including materials, machine tools, inverters and installations. In emerging technologies, it covers organic, high concentration and solar thermal.

You can download the document here: [Solar value chain](#)

Funding renewable energy in a capital constrained world

The funding requirement to achieve global renewable energy ambitions is epic in scale. Renewable energy as a sector must pull in more capital than ever before, at a time when investment needs for other energy infrastructure are booming, and just as funding capacity from banks, corporates and capital markets is the lowest it has been in the past decade.

By focusing on a single region - Europe - we can try to make sense of the funding challenge.

CASE STUDY

Funding European offshore wind

A conservative offshore wind investment assessment is for 36GW of new capacity to be built in Europe by 2020, at a total cost of €113b. If we are less conservative and assume a 52GW build-out on a cost base that does not decline with increasing industry experience and competition, the total cost rises to €178b.

At the very best of times, attracting €17.8b every year for a decade to fund construction of a single technology would be a challenge. Yet the European offshore wind industry must do this just as significant new investment needs arise across a range of assets, such as solar power generation, electricity networks and smart meters. To compound the challenge, these renewable energy and related assets must compete against simultaneous investment requirements across an even broader range of energy infrastructure, from nuclear power plants to gas storage facilities. The total investment requirement for energy networks, storage and generation in the European Union (EU) to 2020 is €1,100b.

How will Europe fund its renewable energy investment ambition of potentially €350b by 2020? Most of this investment will be undertaken by about a dozen leading utilities. How can this be financed? To answer these questions, we must first understand utilities' capacity to undertake new debt-funded capital expenditure.

Utility credit quality has steadily fallen

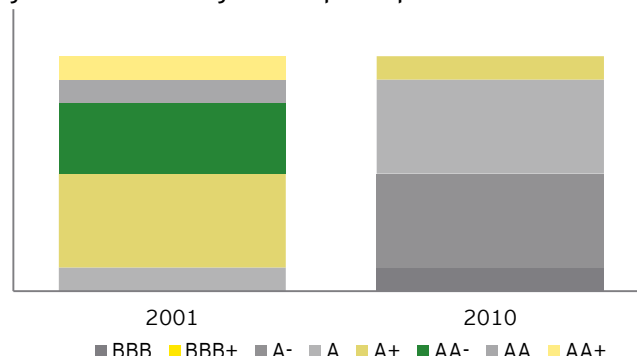
The credit ratings for all of Europe's top utilities have steadily fallen for a decade. In 2001, 9 of Europe's top 10 utilities were rated AA+ to A+. By 2010, only one (EDF) was in that range.

One of the central causes of this credit deterioration is a major expansion in investment. In 2005, capex among the top 10 utilities was on average 60% of operating income; in 2009, it was 78%. Yet this downward trajectory in credit quality is reaching its limit.

As capital intensive businesses, most utilities view an A- rating as an absolute lower limit that must be defended at all costs (e.g., by disposing of assets, or raising new equity through rights issues), to protect the cost of capital and the cost of doing business.

The billions of Euros in renewable energy investment to be undertaken by just a handful of utilities must be added to the other major investments those same utilities are undertaking in assets as diverse as new nuclear plants and carbon capture and storage. It soon becomes clear that traditional corporate financing (bond issuance from a utility holding company supplemented by infrequent equity injections) is not up to the task of funding Europe's ambitions.

Figure 1: Credit ratings of Europe's top utilities



Source: Standard & Poor

Project finance cannot (entirely) save the day

The simple answer to the funding conundrum is "project finance." Traditional (bank-led) non-recourse funding will be a crucial part of Europe's investment in renewable energy. Yet the sheer scale of the required investment raises the realistic question of whether there will be enough bank capital allocated to project lending in the renewables sector to get the job done. With Basel III raising the capital reserves required to support this type of lending, it will become much less attractive to banks just when it is most needed.

A simple conservative case demonstrates that project lending cannot meet the renewable energy industry's financing needs. Assume a €350b funding requirement from 2011 to 2020, a 15% equity contribution on average, and 40 banks active in the sector. This means each bank must issue almost €750m in renewable energy project loans each year for the next 10 years. For many banks this is far beyond their funding appetite or even capacity for exposure to a single energy subsector.

In addition to capital constraints, banks are now confronted with looser project contractual structures that challenge the tolerance of their credit committees: shorter operations and maintenance contracts, weaker warranties, an absence of engineering, procurement and contracting guarantees, weaker (or no) security over assets in some structures, and weaker power purchase agreements (PPAs) (with lenders sharing more risk with off-takers). Increasingly, these credit challenges are only overcome by the imperative of relationship banking.

Yet the industry cannot hang its hat on the promise of relationship banking with industry sponsors to save the day. In short, more money must come from other sources.

Proverbial deep pools

Utilities will be able to fund a portion of the next 10 years' renewable energy development in Europe, supported by banks issuing project loans. But there remains a funding gap, which alternative sources of equity and debt can help close.

New equity sponsors can be pulled into the sector: not simply to replace utility capital, but to add more equity to projects and help fill the debt-funding gap. Utilities may not want to accept the lower internal rates of return that lower leverage implies - but in a capital constrained world, they probably do not have a choice.

As infrastructure, sovereign wealth and pension funds devour traditional developed market infrastructure assets such as utility networks, roads and social infrastructure, new asset classes are needed to soak up this capital. Renewable energy assets can fit the bill if hurdles such as operational track record, regulatory risk, technology risk and deal size can be overcome. The latter challenge may perhaps only be overcome through the establishment of investment funds that pool assets of different technologies. Listing such funds could also attract investors such as mutual funds, which have strict liquidity requirements. The other advantage of investment funds is that they can be structured to attract higher-risk (higher-return) mezzanine-type investors, which represent another deep pool of capital.

Another source of equity that can be further developed in Europe is the use of industrial investors within joint ventures (JVs), in particular supply chain co-sponsors at the project development stage. In contrast, the initial public offering (IPO) market is probably not a viable solution for the early stages of the next decade's capex build-out, based on poor share price performance of some listed (and de-listed) renewable energy companies in recent years.

New sources of debt capital can be found. Even after the credit crunch and the evaporation of some forms of structured finance, it is still a vast pool of capital that dwarfs traditional lending. Securitization markets may rebound to the point where collateralized loan obligations (CLOs) of portfolios of renewable assets are viable. This would be a boon for banks, allowing them to recycle capital lent to the sector. In our post-credit crunch world, CLOs tend to be restricted to the government-backed loan books of single originators. The day a multiparty CLO of renewable energy loans can be sold, the funding pressure on the industry will ease significantly.

Liberating capital

In the absence of a magic financial bullet, the build-out of renewable energy assets will have to be funded with a wide range of debt and equity capital accessed through a wide range of structures, from funds to JVs. But this capital will not flow into the sector on its own: it must be educated, facilitated and assisted. For example, in the near term, a project finance structure may be good enough to reliably attract post-construction refinancing to allow industry sponsors to recycle their capital. But as competition for capital in the sector increases, project sponsors will have to be both more flexible and more creative to realize the full scale of their ambitions.

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Wind sector industry insights – Suzlon

Company: Suzlon Energy Limited

Interviewee: Mr. He Yaozu, China Region CEO

Interviewers: Mengmeng Zhang and Mu He, Copal Partners Beijing

Date: 16 March 2011



Company description

Suzlon Energy Limited (Suzlon) is an India-based, leading global wind power group, engaged in the manufacture of wind turbine generators (WTGs) of various capacities. The group is a highly vertically integrated manufacturer with capability along the full value chain, from components to complete wind turbine systems. The group's global spread extends across Asia, Australia, Europe, South Africa and North and South America. In addition, Suzlon owns 95% of REpower, a leader in offshore wind technology.

Interviewee biography

He Yaozu, CEO of **Suzlon Energy (Tianjin) Limited**, leads Suzlon Energy's operations in East Asia. In addition to his role at Suzlon, Yaozu serves as a Senior Advisor to the Board of the **China Machinery New Energy Corporation**, a major player in the Chinese renewable energy sector. He also serves as a Non-Executive Director of **China Green Power Ltd.**, and he has served on the Board of the **Hoi Sing Industrial Holding Company**. He is a senior fellow of the Hong Kong Institute of Directors. Yaozu brings to Suzlon extensive management and business experience in China, India, Philippines, Thailand and other Asian markets, and key power industry experience from constructing, advising and closing renewable power projects worth over US\$1b (€0.71b) for the **China Machinery New Energy Corporation**. Yaozu has held many senior positions in the past, including China country manager for **Covanta Energy Asia Pacific**, Managing Director of **Global Infrastructure Company (Asia) Ltd.**, Executive Vice President with **Asian Business Solutions (HK) Ltd.**, and Country Manager (Greater China) and Vice President of business development with **Ogden Energy Asia Pacific**. Yaozu graduated with a Bachelor of Science degree in Chemical Engineering from Texas Tech University, and a Masters in Finance from the University of Houston. He also has a senior management diploma from Tsinghua University, China.

What is Suzlon's competitive advantage in the Chinese market? What are Suzlon's future plans in this market?

Suzlon's operations in China feature a good combination of strengths from both developed and developing worlds.

Compared with international players: Suzlon originates from the developing world, and is thus more familiar with China's general market features and more adaptable to the local market.

Compared with local players: Suzlon's products are embedded with cutting-edge wind technology. With R&D centers in Germany, Denmark, Netherlands and India, we offer reliable, robust and cost-effective machines that help wind farm owners maximize profit.

Suzlon China will focus on three priorities in our future work:

- ▶ Further reduce costs through increased localization of our supply chain. To offer a realistic "China price," while maintaining our international quality standards.
- ▶ Add increasing value to our customers' business - providing Chinese customers with full turnkey solutions for overseas projects, which span from land acquisition to wind farm development, operation and maintenance.
- ▶ Actively explore overseas sales opportunities and turn China into a global export base for Suzlon.

There have been continuous price drops in the Chinese market; how will Suzlon cope with this?

Competition has intensified and WTG prices have been driven down dramatically. What I would like to emphasize here is that price per kW cannot reflect the overall cost of wind farm construction and operation; it is the WTG life cycle cost (per kWh) that really determines the profitability of a wind farm. Suzlon's turbines are highly competitive in terms of life cycle cost.

In addition, price reductions at such a rapid rate are not sustainable. With an annual installation of over 18GW (2010), China's wind equipment manufacturing has already reached an enormous scale, making further cost cutting through economies of scale extremely difficult. Thus, further price drops must rely on real improvements in key technologies and production techniques, which cannot happen overnight.

And certainly, we have employed a range of measures in response to the price drops; core among them are the three priorities I mentioned earlier.

We have noticed foreign players' market share has decreased significantly over the past few years. What are the reasons for this? Do you think this trend will continue in the future? As a foreign company, how would you cope with this?

Accompanying China's rapid wind energy growth are rapid changes in the market conditions. Competition has intensified and the market has changed from a seller's market to a buyer's market. This happened so fast that many international players failed to adapt to the changes, leading to a decline in market share. However, the overall "market pie" is getting much bigger now and even a smaller market share can mean a greater sales volume.

I don't know how other international players will do in the future. But I'm confident that, with our new initiatives (mentioned earlier) to spur growth, Suzlon will pick up again in this market.

It is said that turbines produced by local manufacturers are 20%-30% cheaper than their foreign counterparts. Is this true? Is this price difference caused by a quality difference?

There is indeed a price gap between international and local players. It is not appropriate for me to comment on the quality or cost issue of other industry players.

What I will say is that, compared with local players, leading international players in general do bear higher costs and are sometimes less flexible because of international certification. Take GL type certification for example. It provides a good third-party quality guarantee but is costly and time consuming to get. In addition, GL type certification involves not just inspections in design and manufacturing but also testing and qualifications for all key components. For this reason, manufacturers with GL type certificates cannot just switch to the cheapest suppliers whenever they want. The components must be tested and inspected by relevant certification bodies before they can be used in wind turbines.

We noticed the overcapacity situation in the Chinese market; will this change in the future?

Overcapacity is an unavoidable stage on the development path of any emerging industry with great potential.

Overcapacity is often linked to ineffective use of resources and even waste. But on the other hand, overcapacity intensifies competition which in turn drives down cost and improves technology. All of these will make wind energy more competitive to other conventional energy sources and thus less dependent on government support.

As the industry becomes mature, the market will balance out the capacity issue by driving less competitive players out of the market.

What is your forecast for China's future wind energy policies?

With the 15% non-fossil energy target set for 2020, wind energy will remain the focus of renewable energy development. The recent nuclear incident in Japan may also further boost the development of renewable energy, especially wind energy. In general, China will, in the coming years, remain the largest wind energy market globally. Yet, the growth in terms of installation rate will slow down compared with the past few years.

With the increasing concern about quality from the Government and its gradual introduction of relevant industry standards, the focus of the wind energy industry in China will gradually switch from quantity to quality. This will change the competitive landscape of the wind market. We can expect that the degree of concentration will further increase, and companies lacking real competitive strengths will be driven out of the market.

In terms of subsidies and preferential policies, are domestic companies receiving more than international companies?

In terms of direct government subsidies and preferential policies, I don't think domestic companies are benefiting much more than international players these days. China used to have the 70% local content requirement for turbines installed in this market. To an extent this protected local players, but it also forced international players to localize their supply chain which then led to lower production costs and greater competitiveness. There was also a subsidy of CNY600 (€64.8) /kW given to the first 50 sets of turbines produced by local players owning the full intellectual property, but this amount was really not big enough to substantively lower the average cost of local turbines.

As I see, the reason why domestic players have been winning in the market is that local companies can better understand the market conditions and are more adaptable to market changes. They are in general more flexible and more willing to take risks. Flexibility is one of the key areas where Suzlon has been making considerable improvements recently.

Apart from offshore turbines and large onshore turbines, what do you think will be the area of growth in the Chinese market?

Small turbines for scattered households use may be another area of growth. Though for this to start developing, the grid needs to be more flexible in connecting these smaller power sources (i.e., households can buy electricity from the grid when their turbines cannot provide enough electricity, and they can sell to the grid when there is excess electricity). Solutions for this will require changes or improvements to both policy frameworks and physical grid systems.

Do you think international independent power producers (IPPs) will buy Chinese turbines in the future? What are the main considerations?

China's wind turbine manufacturers have grown rapidly as the home market develops, and China's leading suppliers are already looking at international markets for further expansion.

Chinese manufacturers do have their advantages such as cost competitiveness but are also facing challenges when going abroad:

- ▶ Different technical requirements (i.e., international certification such as GL type certification) and market conditions
- ▶ National protectionism
- ▶ Lack of a track record in developed markets, combined with a lack of confidence by international IPPs (already mentioned above), lenders and banks in Chinese-made turbines

The first challenge is caused by lack of knowledge in overseas markets and thus can be overcome in a relatively short period of time. The impact of protectionism will decrease as the world's economy picks up. So I would consider the lack of a track record in developed overseas markets and the lack of confidence in Chinese brands by international IPPs and financial institutions the most challenging barrier for Chinese turbine manufacturers. Building confidence and trust requires continuous investment and may take years before the effort is paid off.

Do you think China will lead the global wind energy market? What are the main challenges for China?

China is already leading global wind energy growth in terms of installation. It is the largest market in both accumulated and newly installed capacity. Its top turbine manufacturers are now among the world's largest ones by installation.

However, China still has a way to go to become the technological leader in the global market. For this, the industry needs to focus more on quality improvement and technical innovation.

Wind sector industry insights – Goldwind

Company: Xinjiang Goldwind Science & Technology Company

Interviewee: Ms. Ma Jinru, Vice President, Secretary of the Board and Company Secretary

Interviewers: Mengmeng Zhang and Mu He, Copal Partners Beijing

Date: 18 March 2011



Company description

Xinjiang Goldwind Science & Technology Company (Goldwind) is one of the largest turbine manufacturers in China and the fourth largest in the world. It is principally engaged in researching, developing, manufacturing and marketing large-sized WTGs. Its major products currently include 1.5MW permanent magnet direct drive (PMDD) and 2.5MW PMDD series wind turbines. The company also provides wind power services and develops and sells wind farms. The company distributes its products mainly within the Chinese market. However, it has begun to enter a number of foreign markets, such as the United States, Australia, Europe and Africa.

Interviewee biography

Ms. Ma Jinru is a Vice President, Secretary of the Board and the Company Secretary of Goldwind. Ms. Ma is a senior Economist. She was an Economist with the Dalian Port Design Institute from 1990 to 1991, Head of the Foreign Trade and Economic Cooperation Department of the Dalian Port Authority from 1991 to 1999, a Manager of the Financial Management Department of the **Dalian Port Container Comprehensive Development Company** from 2000 to 2002, Secretary of the board of directors of Dalian Port Container Co., Ltd. from 2002 to 2005, and Secretary of the Board of Directors and Company Secretary of **Dalian Port (PDA) Co. Ltd.** from 2005 to 2010. Ms. Ma has been an affiliated person of The Hong Kong Institute of Chartered Secretaries since 2006. Ms. Ma joined Goldwind in March 2010. Ms. Ma graduated from Jilin University of Technology in 1990 with a Masters in Transportation Management Engineering.

As Goldwind is one of the leading enterprises in the Chinese wind turbine industry, would you please comment on the overall wind power sector and the current issues?

In 2010, the wind power sector in China continued to grow rapidly. According to the China Wind Turbine Installed Capacity Report released last week by China Wind Energy Association, China's newly installed capacity was 18.9GW, representing an increase of 37.1% over 2009. Goldwind's market share of newly installed capacity was exactly the same as in 2009, i.e., 19.7%, with more than 3.7GW of newly installed capacity. We hold an optimistic view of this sector. Benefiting from the on-grid wind power price of CNY0.51-CNY0.61 (€0.06-€0.07) per kWh and low WTG prices, wind farm operators enjoy positive economic returns.

However, WTG manufacturers suffer a lot from price competition, which translates into declining profit margins. Recently, the average selling price for a WTG has been about CNY3,700-CNY3,900 (€416-€421) per kW. Goldwind's average selling price is at the mid-high end of the industry level price range. By manufacturing the wind turbine parts internally, Goldwind is able to thrive despite the price competition. Almost 100% of the generators and 50% of the electrical control systems we use are manufactured internally. Furthermore, Goldwind acquired two blade factories at the end of last year for future in-house blade production. This in-house production will contribute to our cost-saving strategy. We lost our market leader position in 2007 as we transitioned from the traditional WTG technology into PMDD technology, which we believe is superior. We have an outstanding performance track record for several thousand of our PMDD WTGs that are currently in operation. Due to our innovative technology, high product quality and efforts to enhance customer value, Goldwind won more order bids from public tenders than all of its peers in 2010.

WTG manufacturers and wind farm operators are concerned that fierce price competition might impact product quality. In the short term, we feel that the downside for the average selling price is limited. Small WTG manufacturers are unlikely to survive long-term price competition. We expect industry consolidation in the future, but the timing is uncertain.

Grid constraint issues may be over emphasized as the calculations take into consideration capacity that is still in the construction phase. The rate of grid access reached 70%-80% last year. The Government supports industry development by issuing relevant policies and regulations to encourage manufacturers to meet higher-quality standards and power grid requirements.

It is difficult to quantify the manufacturing overcapacity exactly. The capacity of all the 70-80 WTG manufacturers must exceed the market demand, but the capacity of the top three or top five players is far from enough. Industry concentration is relatively high with the top three players accounting for over 50% of market share and the top five players accounting for more than 70% of market share.

We do pay close attention to the quality of the WTGs, and as a result we have had no major accidents for the past few years. Although there were some accidents last year for a few domestic WTG manufacturers, it is not fair to say that the quality of all domestic WTGs is lower than international WTGs. The dominant players in the Chinese WTG sector are domestic manufacturers. The market share of international WTGs is getting smaller as domestic WTGs have increasingly dominated the wind turbine market. The success of domestic WTG companies is a result of both competitive pricing and high product quality.

Do you think international IPPs will buy Chinese turbines in the future? What are the main considerations? What are Goldwind's plans?

It takes time and a proven track record for international IPPs to completely accept WTGs made by Chinese manufacturers. Goldwind is still considering where to develop manufacturing facilities abroad. We established a company in the US last May and we have several 1.5MW WTGs operating there. The recorded performance figures so far are very good. Goldwind has advantages in capturing the overseas market but it will not use a low pricing strategy. The domestic Chinese market will remain our focus as it has huge potential to grow further.

Going forward, we will focus not only on developed markets, such as the US, Australia, and Europe, but also on emerging markets such as South Africa and Asia. We will adopt diversified strategies in different areas. Recently, we have won several bids in the US, Australia, Ethiopia and Cyprus, for a total of more than 200 1.5MW WTGs.

Do you think that China will lead the global wind energy market? What are the prospects and the main challenges for China?

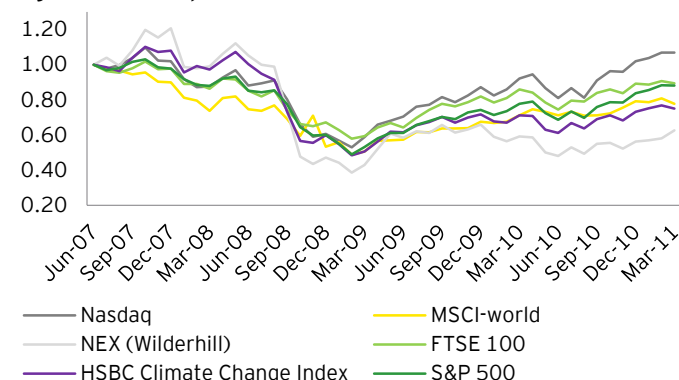
With the rapid economic growth in China, the power consumption potential is huge. Wind energy will be more competitive than other clean energy sources. After the recent nuclear incident in Japan, some nuclear power stations have stopped operations and the Chinese Government has stopped all nuclear project approvals. At the National Energy Commission, Chinese Premier Wen Jiabao commented that the country has set a 15% non-fossil energy target for 2020. Currently, wind power only accounts for 1.18% of total power generations, allowing plenty of room for growth.

In 2010, 3 of the top 5 manufacturers were from China and 7 of the top 15 were from China. In part, Chinese manufacturers' market share has been supported by strong demand in the domestic market and we expect that demand to be stable going forward. Based on our R&D, manufacturing and sales expertise, we believe that Chinese WTG manufacturers are well prepared to provide leadership in global wind power development.

Equity trends

Renewable energy and indices performance

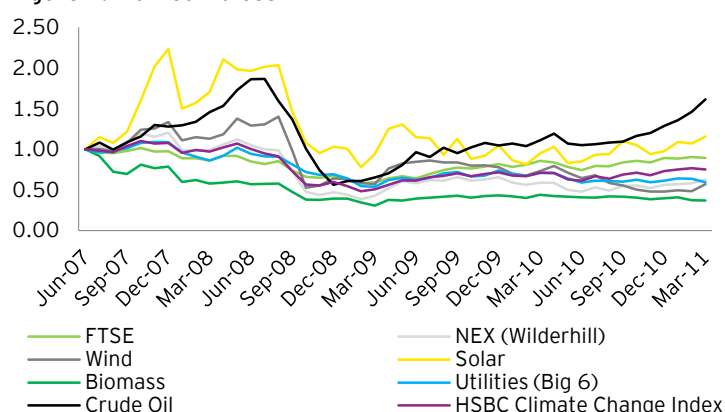
Figure 1: Share price indices



Source: Ernst & Young analysis

During the last quarter, global stock markets have continued to recover from a "double-dip minimum" in June 2010, such that levels are now similar to mid-2008, before the large falls late that year. However, variations are apparent, such as the NASDAQ bouncing back the most, and the renewables-based NEX index rather slower. During 2010, NEX underperformed relative to other indices due to its heavier weighting of US and European companies than the Asian-biased HSBC Climate Change index. In the last few months, however, the NEX has regained some ground - especially during late March - benefiting from speculation of a stronger policy shift to renewable energy following the Fukushima nuclear disaster.

Figure 2: Market indices

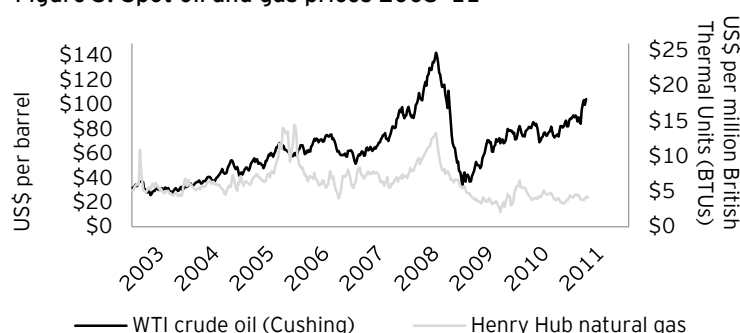


Source: Ernst & Young analysis

Drilling down into the renewable energy markets and also comparing with relative movements in oil price illustrates some other interesting features of the current macroeconomic environment. Due to the unrest in the MENA countries and higher demand for energy as a result of global economic recovery, oil prices have increased significantly in the last six months. Normally, such an oil price increase would imply greater competitiveness for renewable energy, but tightening government budgets and lower gas prices have tempered the renewable energy surge.

The future of incentives across Europe and the US came under increasing pressure in 2010, and this is continuing into 2011. And paradoxically, the extra competitive edge that renewables gain with high oil prices (above US\$90 (€63.8) per barrel) could be counterproductive. Previous Ernst & Young research indicated that as the oil price increases above this threshold (as happened in early 2008), this can lead to an increased risk of financial incentives for renewables being reduced or withdrawn. The story of natural gas prices in the last couple of years is rather different.

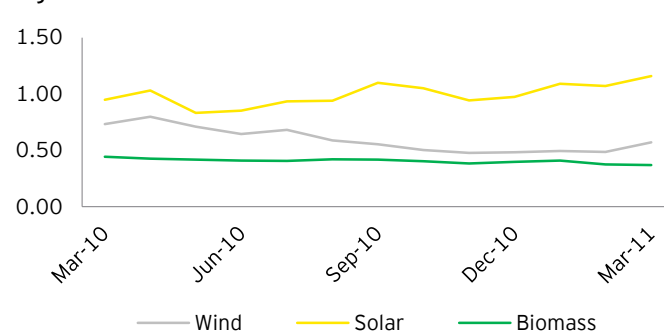
Figure 3: Spot oil and gas prices 2003-11



Source: Ernst & Young analysis

As can be seen in the graph above, natural gas prices in the US have become decoupled from the oil price increases, principally due to large amounts of shale gas coming onto the market. This is having a negative impact on the US renewables market, as the gas is relatively cheap and clean compared with other fossil fuels. It will be difficult for renewable energy to compete against natural gas without large subsidies.

Figure 4: Sector indices



Source: Ernst & Young analysis

Looking at the renewable sectors on their own over the past 12 months reveals some more strong signals. As noted in the November issue of the CAI (Issue 27), the solar sector appears to be weathering the current financing climate better than wind or biomass. It has gained 40% since May 2010, and this is despite the various FIT reductions across Europe. Meanwhile, it is hoped that wind share prices may have turned the corner after losing 20% over the same period. Time will tell.

M&A activity

This quarter's M&A activity has centered around further consolidation by the major infrastructure firms, despite relatively constrained balance sheets. This perhaps reinforces the strategic importance of the sector to major utility players, and vertical integration in the supply chain.

General

It has been a busy quarter for **Iberdrola SA**, the world's largest wind energy company. In March, the company announced that it is seeking to take back control of its renewable energy subsidiary, **Iberdrola Renovables**, by re-acquiring the 20% stake it listed three years ago. **Iberdrola** commented that the renewables sector has changed considerably during this time, and it believes the merger will enable it to "directly manage" the development of its renewable energy activities and generate cost savings. **Iberdrola** is also taking advantage of a 48% decline in the subsidiary's value since the IPO to consolidate ownership at a cheaper price. The proposed consideration is an estimated €2.5b and the transaction is expected to take place in July this year.

Qatar's sovereign wealth fund, **Qatar Holding**, has announced that it is to buy a 6.16% stake in **Iberdrola SA** for €2.2b. The transaction will help **Iberdrola** finance its Brazilian operations and service some of its €24b of debt.

Elsewhere, French utility, **EDF SA**, has also sought to consolidate its position, announcing plans to acquire the remaining 50% of its renewable energy unit, **EDF Energies Nouvelles** for up to €1.5b. EDF hopes the transaction will enable the **EDF** group to benefit fully from the potential high growth of the renewables market.

Wind

EDP Renovaveis SA, the world's third largest wind company, has finalized its purchase of a 20% stake in **Generaciones Especiales**, giving it full control over the Spain-based wind power developer for a consideration of €231m.

US turbine and cable manufacturer, **American Superconductor**, announced in March that it is buying **The Switch Engineering**, a Finnish company that manufactures electrical control systems for wind turbines. **American Superconductor** hopes that the €190m deal will support the company's growth in power control equipment and systems to support wind turbine manufacturers in China, Europe, Korea and the US.

In February, **General Electric Co.**, the biggest manufacturer of wind turbines in the US, acquired **Wind Tower Systems LLC** for an undisclosed sum, in order to gain access to technology that will enable it to increase the height of its wind turbine towers more cost-effectively. The metal lattice system means the turbines can be transported in sections and assembled on site. **GE** plans to install a prototype this year and expects to begin using **Wind Tower's** "space frame systems" commercially in 2012.

Solar

In a bid to strengthen its competitiveness in the silicon industry, **China National Bluestar Group Co.**, a global leader in synthetic materials, has acquired a 100% stake in **Elkem**, the Norwegian manufacturer of solar grade silicon. The US\$2b (€1.4b) deal is one of the largest industrial takeovers by a Chinese firm in Europe and will also offer **Elkem** greater access to Asian markets.

In late April, French energy company, **Total SA**, announced it plans to pay up to US\$1.37b (€0.97b) for a 60% stake in California-based **SunPower Corp.** The oil and gas giant hopes this will give it a foothold in the rapidly growing solar power market. As part of the deal, Total will provide **SunPower** with a credit line of up to US\$1b (€0.71b) to support its solar plant developments and expand manufacturing capacity. Given the current weakness in the European solar market, as a result of recent subsidy cuts, the deal has surprised some market analysts.

Hydro

Innergex Renewable Energy Inc. has acquired Vancouver-based hydroelectric developer **Cloudworks Energy Inc.** for US\$185m (€131.2m). **Cloudworks** owns a 50.01% stake in six run-of-river hydroelectric facilities with a combined installed capacity of 150MW, and has full ownership over development projects with a potential aggregate installed capacity of over 800MW. US-based **Innergex**, also a developer of run-of-river hydroelectric facilities (and wind energy projects), hopes the transaction will expand its asset portfolio and enhance its growth profile.

Geothermal and other

In early March, Canada-based geothermal power developer, **Magma Energy Corp.**, announced it would merge with **Plutonic Power Corporation** to create **Alterra Power Corporation**. **Plutonic** operates hydroelectric and wind facilities, and announced plans to acquire three solar PV projects from **First Solar Inc.** earlier in the year. The CA\$454.8m (€332m) merger will increase the new entity's installed production capacity base to 366MW across three key sectors, including hydro and wind, but will retain a core focus on geothermal.

This is a sample of the main global M&A transactions in the renewables sector over the past quarter.

Sources

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

IPO activity

IPO activity across the renewables market remained relatively stagnant in the first quarter of the year. Some analysts have attributed the lack of movement to recent political and economic volatility in North Africa and the Middle East, natural disasters in Japan and Australia, and ongoing debt concerns across Europe. Others have argued renewable energy is simply too risky and not yet sufficiently developed to manage the uncertainties.

Ernst & Young LLP Partner, Andrew Perkins, believes that the slow growth in the renewables IPO market is evidence of investors' reluctance to commit considerable funds to project-based companies that generate a relatively low yield, unless the company is able to secure a significant project portfolio and forecast reasonable returns. According to Perkins, this is unlikely to change in the short term unless investors reassess the way they view public markets, seeking reasonable flat-rate yields as opposed to chasing after growth profits. In the meantime, technology companies producing profitable green products such as smart meters and insulation, as well as supply chain companies, are likely to be stronger contenders for IPOs in the short to medium term.

General

In March, Poland's top utility, **PGE**, announced that it plans to float its renewable energy arm, **PGE Energia Odnawialna SA**, on the Warsaw Stock Exchange in the fourth quarter of this year, most likely comprising new-issue shares only. The renewables unit has ambitious plans to have around 1GW of wind power capacity by 2015.

Wind

Tongyu Heavy Industry Co. Ltd raised CNY2.3b (€250m) via an IPO on the Shenzheng Stock Exchange in March. The China-based wind turbine component manufacturer has said it will use the proceeds for R&D, and the manufacture and sale of large forging products.

Chinese power company, **Huaneng**, has indicated that it may re-launch the IPO of its wind power unit, **Huaneng Renewables Corp Ltd**, later this year if market conditions were right. **Huaneng** aborted the CNY10b (€1.1b) IPO in December last year, citing poor market conditions.

Solar

In February, **LDK Solar** announced its plans to float its polysilicon business, **LDK Silicon & Chemical Technology**, on the Hong Kong Stock Exchange in the second half of 2011. The offering size has not yet been fully disclosed but reports indicate a value range of US\$0.7-US\$1.3b (€0.5-€0.9b) and suggest the funds will be used to expand production capacity. There are rumors that **LDK** launched a roadshow for the IPO in March and that **Citigroup** has been hired to underwrite the transaction, although nothing has been confirmed by the group.

The outcome of the IPO will be of particular interest to new investors in the polysilicon business. In January, **LDK** sold US\$240m (€170m) worth of shares in the subsidiary to a group of investors led by the **China Development Bank Corporation**. **LDK** will be required to compensate investors with cash if it fails to achieve net income targets, but the investors will waive such compensation if the polysilicon subsidiary achieves a qualified IPO during 2011.

US solar CSP developer, **Brightsource Energy**, announced plans to raise up to US\$250m (€177.3m) via an IPO on the New York Stock Exchange, in order to generate funds to complete a series of power plant projects and fulfill power delivery contracts to utilities. The company, currently constructing the 392MW Ivanpah project in the Mojave Desert in California, is yet to price its shares.

Xinyi Glass Holding Ltd, a Chinese manufacturer of integrated glass coverings for solar panels, has announced plans to list its shares in Hong Kong in the third quarter of this year. The integrated flat glass producer will seek to raise around US\$600m (€425.6m) in the IPO.

In April, **Isovoltaic**, an Austrian-based solar technology group, canceled its plans to raise up to €378m in an IPO in Vienna. The announcement came less than a month after the company began seeking investor interest for its offering, and has blamed "the most recent developments on the European IPO markets" for the withdrawal. The company, which considers itself a global leader in the solar backsheet market, said it was confident that it could continue its successful path independently of a stock market listing. The public sale of the 45% stake would have been the biggest European IPO for a solar power company since June 2008.

Tidal

In January, **Atlantis Resources Corp Pte Ltd**, a tidal power project and turbine developer based in Singapore, announced its plans to raise up to AU\$150m (€109.7m) via an IPO in Australia.

This is a sample of the main global IPO transactions in the renewables sector over the past quarter.

Sources

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

All renewables index at May 2011

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	72	78	80	71	62	67	48	59	52	79
2 (2)	USA ³	67	66	70	55	74	73	77	61	67	60
3 (3)	India	63	63	71	42	65	70	53	59	45	65
4 (3)	Germany	62	66	63	74	48	66	0	63	55	63
5 (5)	Italy	60	62	65	54	58	64	45	56	65	68
6 (5)	UK	59	66	61	78	37	51	0	58	37	68
7 (7)	France	57	60	61	56	50	58	31	59	35	61
8 (8)	Spain	55	55	60	42	62	61	65	49	33	55
9 (9)	Canada	53	59	64	45	33	46	0	49	34	62
10 (11)	Greece	50	51	55	40	54	59	40	41	32	52
11 (11)	Sweden	49	53	54	52	31	44	0	55	34	53
12 (10)	Portugal	48	50	54	38	50	54	39	42	29	49
12 (16)	Brazil	48	50	54	39	42	46	32	50	22	47
14 (11)	Ireland	47	54	54	53	24	33	0	45	25	53
14 (16)	Poland	47	53	57	42	31	43	0	42	23	48
16 (18)	South Korea	46	47	46	51	46	53	29	41	36	44
16 (14)	Australia	46	45	48	36	51	51	52	41	55	41
18 (18)	Netherlands	45	51	50	54	33	46	0	39	21	42
18 (18)	Belgium	45	52	50	58	30	42	0	39	28	52
18 (15)	Japan	45	45	47	38	52	61	26	37	40	50
21 (23)	Romania	44	48	51	38	32	44	0	43	38	43
22 (21)	Denmark	43	47	44	55	29	40	0	45	32	51
23 (25)	Mexico	42	42	43	39	45	46	40	38	54	38
24 (23)	Norway	41	47	48	45	22	30	0	44	30	48
24 (21)	Egypt	41	42	46	33	44	43	46	36	25	37
24 (27)	Turkey	41	43	46	34	39	43	30	36	43	43
27 (na)	Morocco	40	40	44	28	50	50	51	35	23	47
27 (27)	South Africa	40	43	46	34	38	35	46	35	32	43
27 (25)	New Zealand	40	46	49	36	23	32	0	34	51	45
30 (29)	Finland	39	43	45	37	19	27	0	50	24	40
30 (na)	Taiwan	39	42	44	37	32	44	0	32	35	40
32 (na)	Bulgaria	37	38	43	26	34	47	0	33	35	44
33 (29)	Austria ⁴	36	32	40	0	39	54	0	48	34	51
34 (na)	Chile	31	33	36	24	31	36	18	26	34	38
35 (na)	Czech ⁴	30	31	39	0	25	34	0	29	23	48

Notes:

Source: Ernst & Young analysis

1. Ranking in Issue 28 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.

Q1 saw the release of the latest wind statistics covering 2010 installed capacity and revised forecasts by a number of wind energy consultancies. These figures have been incorporated into the CAI scoring model to re-benchmark the current installed base parameter, and wind projections previously included within the near-term index score have now been incorporated into the market growth potential parameter based on four-year forecasts. The near-term index is no longer part of the CAI analysis.

The emergence of solar as an increasingly mature and attractive technology has been reflected by an adjustment to the technology weightings used to calculate the All renewables score, slightly increasing the proportion allocated to solar balanced by a slight reduction in wind. A benchmarking exercise has also been performed on the CSP index to reflect the latest data released by CSP Today. Some movements in the indices may therefore be attributable to these non-quarter-specific movements.

China has edged up another point to reach its highest score so far. This reflects increased support for the development of shallow water offshore wind projects and the release of the "greenest" five-year plant to date. The announcement that California's **ESolar Inc** and China's **Shandong Penglai Electric Power Equipment Manufacturing Co.** will spend CNY6b (€0.7b) to develop a 300MW solar CSP plant is a further sign that investors are seeking more diversified portfolios.

The US is a non-mover in the All renewables index as the battle over the future of its clean energy policy continues. The President's 2012 budget proposal calls for increased funding for clean energy, and loan guarantees were left untouched in the 2011 Budget Review. A CES has emerged as the most promising piece of energy legislation; however, continued Republican opposition is likely to create a policy stalemate.

All renewables index at May 2011 (cont'd)

India continues to slowly climb the rankings, leaving Germany in fourth position, a sign that developers are favoring countries with high economic growth. In order to meet the Government's ambitious plans for wind and solar, **Suzlon Energy** intends to invest US\$1.3b (€0.9b) to develop 1GW of new wind capacity in Gujarat by 2013.

Germany has dropped a point in the All renewables index due to the solar benchmarking exercise. In addition, the long-term horizon for wind power growth in Germany has been revised down as the industry matures and space for new development becomes limited.

Italy has dropped two points in the All renewables index in light of the new decree that sets out phased reductions to FITs for solar PV installations from June 2011 onward.

In the UK, the results of Department of Energy and Climate Change's (DECC's) "fast track" review of FITs for solar PV has resulted in dramatic cuts for installations over 50kW, due to come into effect on 1 August 2011. This has been exacerbated by the ongoing review of the proposed Electricity Market Reform (EMR) and the announcement of the early Renewable Obligation Certificate (ROC) banding review. This uncertainty has caused the UK to fall three points in the All renewables index. Last year, there was only US\$3.3b (€2.3b) of private investment in renewables in the UK, compared with US\$11b (€7.8b) in 2009.

France has slipped a point in the All renewables index due to continued uncertainty over its tendering system for large-scale solar projects. **First Solar Inc.** and **EDF Energies Nouvelles SA** have placed a 120MW project on hold until more clarity over the tendering has been unveiled.

The fall of Portugal's Government, the downgrading in sovereign credit rating and that of the Portuguese utility, **Energias de Portugal**, combined with the requirement for an EU bailout, have all dampened the outlook for the renewable energy industry. Political and economic uncertainty could heighten financing risk and, as a result, Portugal has fallen four points in the All renewables index. However, it has benefited from the CSP benchmarking.

Brazil has risen four places in the All renewables index as it seeks to reduce its reliance on large scale hydropower and take advantage of the strong Atlantic trade winds to develop its offshore potential and build out its onshore development pipeline of 5GW to 2014. The Brazilian developer, **Renova Energia**, aims to spend US\$710m (€504m) to build the largest wind farm complex comprising 14 sites, while India's **Suzlon** and Portugal's **Lusobras** are also seeking to take advantage of the high wind speeds.

Australia has fallen three points in the All renewables index in the aftermath of the floods in Queensland. The Government has reduced spending on renewables by AU\$1.8b (€1.3b), including a AU\$250m (€183m) reduction in the Solar Flagship Program, which was intended to support large-scale solar power plants.

Japan has dropped three places in the rankings as the short-term focus on natural gas and fuel oil imports to replace lost nuclear power capacity is likely to hamper renewable energy investment. The long-term horizon is less clear, with analysts predicting that the Government could favor distributed generation based on renewable technologies to achieve a more balanced and secure energy supply.

Romania has gained a point in the All renewables index as its installed wind capacity is set to double by the end of 2011 to 1GW. Spain's **Iberdrola SA** is seeking to exploit the abundant wind resources by building the world's largest onshore wind farm. The facility, which will have a total capacity of up to 1.5GW once complete, is to be built in phases between 2011 and 2017.

Political unrest in North Africa and the Middle East has caused short-term market volatility in the renewables industry. Egypt is one country that has felt the repercussions, as financial markets have become unsettled and access to finance is restricted, with banks having closed their doors. Its booming wind sector has had to stall bids for 500MW of projects. **Renewable Energy Systems** has also stalled plans to develop projects independently as it awaits long-term political certainty over Egypt's renewable energy policy. As a result, Egypt has decreased three points in the All renewables index.

Having announced ambitious renewable energy targets at the beginning of 2011, South Africa has dropped a point in the All renewables index after the national regulator, NERSA, proposed a significant reduction in FIT for all technologies. This includes a 40% reduction for landfill gas and solar PV.



Wind indices at May 2011

Rank ¹	Country	Wind index	Onshore wind	Offshore wind
1 (1)	China	78	80	71
2 (4)	Germany	66	63	74
2 (3)	USA ²	66	70	55
2 (2)	UK	66	61	78
5 (5)	India	63	71	42
6 (6)	Italy	62	65	54
7 (7)	France	60	61	56
8 (7)	Canada	59	64	45
9 (10)	Spain	55	60	42
10 (9)	Ireland	54	54	53
11 (12)	Sweden	53	54	52
11 (13)	Poland	53	57	42
13 (14)	Belgium	52	50	58
14 (14)	Greece	51	55	40
14 (14)	Netherlands	51	50	54
16 (11)	Portugal	50	54	38
16 (18)	Brazil	50	54	39
18 (24)	Romania	48	51	38
19 (20)	South Korea	47	46	51
19 (20)	Norway	47	48	45
19 (20)	Denmark	47	44	55
22 (20)	New Zealand	46	49	36
23 (17)	Australia	45	48	36
23 (18)	Japan	45	47	38
25 (29)	Finland	43	45	37
25 (26)	South Africa	43	46	34
25 (26)	Turkey	43	46	34
28 (na)	Taiwan	42	44	37
28 (25)	Egypt	42	46	33
28 (26)	Mexico	42	43	39
31 (na)	Morocco	40	44	28
32 (na)	Bulgaria	38	43	26
33 (na)	Chile	33	36	24
34 (30)	Austria	32	40	0
35 (na)	Czech	31	39	0

Source: Ernst & Young analysis

Notes:

1. Ranking in Issue 28 is shown in brackets.
2. This indicates US states with RPS and favorable renewable energy regimes.

China overtook the US at the end of 2010 to become the world leader in wind power installations. At the end of 2010, it had an installed capacity of 41.8GW, compared with 40.2GW in the US. Growth in the offshore industry is also expected to boom as the Government continues to promote the technology, which has 200GW of potential according to the Global Wind Energy Council (GWEC). A reduction in turbine prices from CNY7,000 (€758) /kW in 2007 to CNY3,700 (€401) /kW in 2010 has also aided industry growth. As a result, China has climbed two points in the wind index.

The German Government's recommendations for amendments to the Renewable Energy Law 2012 include an increase in the degression of onshore wind FITs from 1% to 2% from 2012 onward, reflecting a decrease in turbine prices as the industry matures. The long-term horizon for offshore wind looks more positive, with a recommendation to increase FITs from €130/MWh to €150/MWh for the first 12 years and a further "compression model" option for a €190/MWh for 8 years instead of 12 years. There has been no change in the index as the industry awaits further announcements.

The US has fallen a point in the wind index as uncertainty over Federal policy has led to some project developers stalling investments in the sector, resulting in a reduction in installed capacity. According to the American Wind Energy Association, 5.1GW of wind power capacity was installed in 2010, compared with 10GW of capacity in 2009.

The UK fell two points in the wind index as growth in onshore developments slowed to 504MW in 2010 (down from 793MW in 2009), taking total onshore capacity to 3.9GW. Grid connection and planning bottlenecks continue to create project delays.

The AU\$1.8b (€1.3b) cut on clean energy spending is set to reduce investment demand for wind power in Australia, which has fallen four points in the wind index.

Canada fell a point in the wind index as the potential for offshore wind power in the North American Great Lakes took a setback in the province of Ontario, where the provincial Government has placed a moratorium on freshwater wind farm construction.

The downgrading of Portugal's credit rating to BBB and the bailout of its economy has made access to finance for infrastructure projects limited in the short term.

Brazil looks set to become the next global powerhouse in onshore and offshore wind, with developers such as **General Electric**, **Siemens AG** and **Suzlon** taking advantage of the high wind speeds. The productivity of Brazilian wind farms has yielded the world's lowest offtake prices at auction, with developers agreeing to sell electricity for an average of US\$79 (€56) per MWh.

Of the new additions to the CAI, Taiwan has the strongest wind potential, with a current installed base of 506MW for onshore wind farms. The recent 30% increase in the offshore tariff, alongside the creation of a US\$313m (€222m) offshore demonstration zone by the Pengu archipelago in the Taiwan Strait, is set to spur investment in the industry.

Solar indices at May 2011

Rank ¹	Country	Solar index	Solar PV	Solar CSP
1	(1) USA ²	74	73	77
2	(2) India	65	70	53
3	(5) China	62	67	48
3	(4) Spain	62	61	65
5	(3) Italy	58	64	45
6	(6) Greece	54	59	40
7	(6) Japan	52	61	26
8	(9) Australia	51	51	52
9	(10) France	50	58	31
9	(na) Morocco	50	50	51
9	(11) Portugal	50	54	39
12	(6) Germany	48	66	0
13	(12) South Korea	46	53	29
14	(13) Mexico	45	46	40
15	(13) Egypt	44	43	46
16	(15) Brazil	42	46	32
17	(18) Turkey	39	43	30
17	(16) Austria	39	54	0
19	(19) South Africa	38	35	46
20	(16) UK	37	51	0
21	(na) Bulgaria	34	47	0
22	(20) Canada	33	46	0
22	(21) Netherlands	33	46	0
24	(na) Taiwan	32	44	0
24	(22) Romania	32	44	0
26	(22) Sweden	31	44	0
26	(22) Poland	31	43	0
26	(na) Chile	31	36	18
29	(25) Belgium	30	42	0
30	(26) Denmark	29	40	0
31	(na) Czech	25	34	0
32	(27) Ireland	24	33	0
33	(28) New Zealand	23	32	0
34	(29) Norway	22	30	0
35	(30) Finland	19	27	0

Source: Ernst & Young analysis

Notes:

1. Ranking in Issue 28 is shown in brackets.
2. This indicates US states with RPS and favorable renewable energy regimes.

The US has surged ahead in the solar index, climbing two points this issue, following news that the market grew 67% from US\$3.6b (€2.6b) in 2009 to US\$6b (€4.3b) in 2010. The Department of Energy (DOE) has fueled a lot of this growth, supporting both manufacturers and developers with a US\$1.1b (€0.8b) loan guarantee to US solar panel makers, while **NRG Energy** was awarded a US\$967m (€686m) loan guarantee to help pay for the world's largest solar PV plant. **BrightSource Energy Inc** also received a US\$1.6b (€1.1b) loan guarantee and equity finance from **Google Inc.** to develop the world's largest CSP plant, with an installed capacity of 392MW. These projects reflect the emergence of utility-scale plants as investors turn their attention to the US, following recent cuts in Europe.

In early May, the Italian Government approved a new solar PV decree, the "Fourth Conto Energia." The new decree will significantly reduce FITs starting from June 2011, imposing monthly reductions through to December 2011 and twice-yearly reductions in 2012-13. A new distinction will also divide new PV plants into "small" and "large" sites - the threshold is 1MW and 0.2MW for building-integrated and ground-mounted installations respectively. The latter category will be subject to strong limitations and lower incentives. While the announcement ends months of uncertainty, the decree is expected to slow new installations significantly in Italy during the next few years. As a result, Italy has fallen two places in the solar indices.

As Germany's solar industry matures, there are concerns around the ability of the grid to manage the intermittency caused by the increasing proportion of solar electricity being fed into it. These concerns have been reflected in the Federal Government's recommendations for amendments to the Renewable Energy Law 2012, proposing proactive grid management of solar PV.

Australia has fallen two points in the solar index as the Government plans to reduce the Flagship Solar Program by AU\$250m (€183m), while it has also capped the Renewable Energy Bonus Scheme which provides incentives for solar hot water systems, saving AU\$160m (€117m).

In March 2011, the French Government followed the trend across Europe and imposed solar FIT cuts. It also announced a 500MW annual cap on installations and 20% FIT cuts for projects below 100kW. Projects over 100kW will have to bid through a public tender. France has dropped a point in the indices as a result.

In March, the UK Government announced the results of its fast track review of FIT rates, reducing tariffs by as much as 72% for projects up to 5MW from 1 August 2011. This is more bad news for a market that has already seen an exodus of developers due to uncertainty over the long-term political outlook in the UK, resulting in a three point decrease in the solar indices.

Morocco shows the greatest solar potential of the new entrants. In December 2010, it selected four groups for the first phase of a 500MW solar thermal project, which represents part of the DESERTEC program. Political unrest in North Africa could stall the development of the program in the short term, but it is still planned to deliver the 500MW capacity by 2015.

Country focus - China



China investing in offshore wind and solar CSP

Ranking	Issue 29	Issue 28
All renewables index	1	1
Wind index	1	1
Solar index	3 ¹	5

¹Joint Source: Ernst & Young analysis

Policy

In March, the National People's Congress voted through the 12th Five-Year Plan (FYP) 2011-15 for National Economic and Social Development, hailed as the "Greenest FYP in China's history", with a third of the targets relating to environmental issues.

China surpassed the US to become the world's largest energy consumer in 2010, but environmental targets set out in the FYP include an increase in the proportion of primary energy generated by non-fossil fuels to 11.3% by 2015, from the current 8.3%. To help meet this target, China intends to build at least 70GW of new wind farms and 5GW of new solar farms.

Access to finance

The latest statistics from BNEF indicate that, in 2010, the China Development Bank (CDB) made around US\$35b (€25b) in low-interest credit available to Chinese renewables companies. This compares to US\$4b (€2.8b) of grants and US\$16b (€11.4b) in loan guarantees awarded to clean-tech companies in the US.

China's aid to the country's clean-energy sector has been criticized, however; a complaint filed with the World Trade Organization in December 2010 by the US claimed that the assistance given to China's wind energy manufacturers violated global trade rules. Notwithstanding, the CDB agreed in March to lend CNY12b (€1.3b) to the **Linuo Group**, a solar cell maker looking to expand its capacity tenfold.

Wind

China overtook the US at the end of 2010 to become the world leader in wind power installations. The latest GWEC statistics show that China installed around 16GW in 2010 - representing almost half of global installations - taking cumulative installed capacity to 42GW. This is contrasted with an additional 5GW installed in the US last year and a total capacity of 40GW.

However, China ranks second globally in terms of grid-connected capacity; more than a third of wind capacity had yet to be connected to the national grid at the end of 2010. Grid operators are required by law to buy all output from renewable projects; however, grid planning lags behind wind power developments and often the regions with abundant wind power are far from populated or industrial areas. China will therefore require extensive grid upgrades to take advantage of the estimated 300GW of technically exploitable onshore wind resource.

Q1 saw the tightening of rules over turbine manufacturing in a bid to control overcapacity and prevent prices being forced down. Local investment bureaus have been asked *not* to approve the

construction of new turbine production plants, excluding the expansion of existing facilities. This follows a policy implemented last year which ruled that government support will only be awarded for the production of turbines 2.5MW or greater.

Offshore wind

Onshore wind grid issues and support for large-scale turbine manufacture has enabled enthusiastic provincial governments to persuade national authorities of the potential for offshore wind in China's energy mix. While the market is still in its infancy with only a single operating project - the 102MW Donghai Bridge plant near Shanghai- strong growth is forecast in the next decade.

Provincial governments suggest that 30GW by 2020 is a realistic target, and developers will be able to take advantage of the offshore FIT of CNY0.62-CNY0.73 (€0.07-€0.08) per kWh. The National Development and Reform Commission (NDRC) has recently awarded licenses to build four offshore wind farms in eastern China's Jiangsu Province. These include two 200MW projects located at Daefeng and Dongtai, a 300MW wind farm site at Sheyang and another 300MW project to be built at Binhai.

Solar

Japan's nuclear disaster has prompted the NDRC to call for an increase in China's solar capacity target from 20GW to 50GW by 2020. There is pressure on China to develop its own solar market and reduce reliance on the export of components, amid concerns that cuts to European FIT schemes and a growing supply chain in the US could lead to an oversupply of panels.

Solar CSP

In a bid to further diversify its energy mix, China is preparing its second CSP tender - a 92MW project in Yulin City. The project will cost around US\$300m (€213m) and utilize US technology developed by **ESolar Inc.** **ESolar** has also announced that it plans to co-invest US\$915m (€649m) to build the 300MW Fuxin solar thermal power project.

China is using competitive bidding rather than European-style subsidized FITs in order to reduce power prices: the Government's first CSP tender generated an average solar power price of CNY0.96 (€0.104) per kWh compared with €0.475 in Spain, although this is still double the price of conventional power. The larger state-owned utilities appear to be content, in the short term at least, to sacrifice financial return for the opportunity to gain expertise. However, China has indicated that it will spend the next year studying Europe's premium payment schemes for solar power in order to determine the most effective incentive system.

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Country focus - US



Support from Obama but stalemate continues

Ranking	Issue 29	Issue 28
All renewables index	2	2
Wind index	2 ¹	3
Solar index	1	1

¹Joint Source: Ernst & Young analysis

Targets and budget

In his annual State of the Union address, President Obama called for legislation that would require the generation of 80% of US energy from "clean" sources by 2035. This was reflected in his 2012 fiscal budget proposal, sent to Congress in February, which included a total of US\$29.5b (€21b) for the DOE, a 12% increase compared with estimated spending this year.

In a bid to make additional spending on clean energy "deficit neutral," Obama's budget also proposed raising US\$4b (€2.8b) over 10 years through the elimination of tax subsidies awarded to oil, gas and coal companies. However, this has been successfully opposed by Republicans twice in the past amid concerns over higher energy prices and labor cuts. The Republicans' own 2012 budget, released in early April, calls for more significant cuts in order to manage the country's US\$1.6t (€1.1t) deficit, including a 91% cut in funding for energy and environment programs.

Q1 also included the fiscal 2011 budget update, which will keep the Government operating through to the end of September. The budget review left government loan guarantees for clean-energy projects relatively unscathed, despite Republican lobbying to reduce funding for energy assistance programs. However, overall spending on energy programs will be set at US\$31.8b (€22.5b), a 10% reduction on the President's original budget request.

Policy

The higher proportion of Republicans in Congress following the 2010 midterm elections makes passage of any comprehensive climate change or renewable energy legislation increasingly unlikely in the near term, despite renewed efforts by some senators to introduce a national renewable electricity standard. This would require utilities to generate 25% of their electricity from renewable sources by 2025. Political stalemate and budget constraints also make it increasingly unlikely that cash grants and tax credits will be extended beyond 2012.

The CES currently being debated by Congress is the most likely piece of energy legislation to be introduced in 2011. A CES would support not only renewables but also nuclear power, natural gas and coal plants with CCS technology. While critics claim these are not all "green" options, and important details are yet to be clarified - such as which energy sources will qualify as "clean" and in what proportions - the CES is a political compromise that is more likely to be approved given political tensions, compared with a renewable-only electricity standard.

While a national standard is therefore increasingly unlikely, April saw California's legislature successfully pass the most aggressive

Renewable Portfolio Standard (RPS) in the US. The law requires major utilities to generate 33% of power from renewable sources by 2020, up from the 2010 target of 20%, which was missed and therefore extended to 2012.

In early April, the House of Representatives passed a bill prohibiting the Environment Protection Agency (EPA) from regulating greenhouse gas emissions, defying a veto threat from Obama's administration. Republican opposition to the EPA claims that emissions rules threaten the reliability of the power generating system and increase electricity prices.

Onshore wind

The latest GWEC wind statistics show that 5.1GW of wind capacity was installed in 2010 - a 52% decrease on 2009 - taking total installed capacity to 40.2GW at the end of 2010. This fall has been attributed to uncertain federal policies, although a flurry of activity in Q4 2010 can be ascribed to the original Treasury Grant deadline of 1 January 2011 forcing developers to rush project commencement, resulting in a slow first quarter in 2011.

Offshore wind

The Obama Administration is looking to expedite offshore wind development and has identified four suitable zones. Environmental reviews of the designated areas (located in federal waters along the coasts of New Jersey, Delaware, Maryland and Virginia) will be conducted by the Interior Department, and leases could be issued to energy developers by the end of the year.

The Interior Department is also currently assessing the first ever right-of-way application, submitted by the developers of the US\$5b (€3.5b) Atlantic Wind Connection, an underwater transmission line designed to connect the four zones and enable up to 7GW of offshore wind capacity to be connected to the grid.

Solar

The PV market experienced strong growth in 2010, installing around 1GW of new capacity, taking cumulative solar capacity to 2.6GW. The latest figures also show that the US now has 17 CSP plants, totaling 507MW. The DOE has set a goal of reducing the cost of solar to US\$1per watt (parity) in the next decade.

In April, the DOE awarded US\$5b (€3.8b) in loan guarantees to three large solar projects, including US\$1.2b (€0.9b) to the 250MW California Solar Valley Ranch power plant - likely to be one of the world's largest PV projects - and US\$1.6b (€1.13b) to **Brightsource Energy's** 392MW Ivanpah CSP project. A guarantee for US\$2.1b (€1.1b) was awarded to the 484MW Blythe Solar Plant, which will be the world's largest solar CSP project.

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Country focus – India



Indian RECs fetch maximum price in first sale

Ranking	Issue 29	Issue 28
All renewables index	3	3 ¹
Wind index	5	5
Solar index	2	2

¹Joint Source: Ernst & Young analysis

Budget

India's 2011-12 General Budget was announced in early March. It included a strong emphasis on reductions in customs and excise duties to encourage the adoption of clean technology, including the elimination of customs duty on components used in the manufacture of solar cells or modules.

However, the renewables sector has expressed its disappointment at the lack of "aggression" and support for renewable energy in the annual budget. There are claims that the piecemeal solar incentives ignore a large number of other components and fail to address the continued reliance on imported engineering services. There was general support, however, for the budget's provisions to double the cap on foreign investment in corporate bonds to US\$40b (€28.4b) and allow companies to issue tax-free bonds to finance infrastructure projects. It is hoped such measures will help support the financing of large-scale renewables projects.

Grid

There was disappointment for clean-energy companies that the budget did not address the "inadequate" transmission grid, which many argue is holding up investments and delaying projects. India suffers from a chronic electricity shortage, aggravated by the lack of a robust nationwide electricity grid, making it difficult to fully harness renewable energy potential.

However, the Finance Ministry has announced it is considering using part of the US\$555m (€393.7m) Clean Energy Fund – funded by a coal tax launched as part of last year's budget – to finance new electricity transmission lines to help distribute power from clean-energy projects, specifically in states which severely lack the necessary infrastructure.

Incentives

India began trading its Renewable Energy Certificates (RECs) in late March, signaling a key milestone in the development of the country's market mechanism for renewables incentives. Trading commenced on the Indian Energy Exchange (IEX) and Power Exchange India (PXIL), and a total of 532 (non-solar) RECs were issued, of which 424 were sold on 30 March. RECs sold on the IEX fetched the ceiling price of INR3,900 (€60.9), while credits achieved INR2,225 (€34.7) on the PXIL. Demand for solar RECs was high but there were no sell-side bids in the initial trading. Regulators have set a price range of INR12,000-INR17,000 (€187-€265) per REC for solar projects. However, analysts are already predicting a dip in trading if obligated entities put off participation until the end of the annual RO period; the slowdown in trading during April already supports this view.

Solar

In Q1, developers of the 37 projects contributing 620MW toward Phase 1 of India's National Solar Mission (NSM) signed their respective PPAs with the Government. The NSM aims to add 20GW of solar capacity by 2022, and 1GW by 2013 under Phase 1. This positive development is likely to dispel fears that PPAs would not be signed, given the low tariffs quoted in the bids. The fact that the agreements fall within the first anniversary of launching the NSM reinforces the timely execution of Phase I and signifies the Government's commitment toward development of solar power. The Government is also soon expected to initiate the process for a further allocation of 296MW of grid-connected solar PV power projects.

India is to impose fines on delayed solar projects, after five out of six plants failed to launch in early 2011 as planned. Penalties in the PPAs will therefore be executed at INR10,000 (€156) a day per MW for the first 60 days and INR15,000 (€234) thereafter.

Wind

The latest wind statistics from GWEC show that 2.1GW of wind capacity was added during 2010, taking total installed capacity to around 13GW – making India the fifth-biggest wind power producer in the world. The World Institute for Sustainable Energy in India estimates wind power potential could be as high as 100GW if larger turbines are deployed and access to land is improved, although grid weakness is likely to prevent full exploitation of this resource in the short to medium term.

Major renewables companies continue to be attracted to India's wind market. Suzlon has signed a memorandum of understanding with the Gujarat State Government to invest INR60b (€0.94b) to develop 1GW of wind capacity over the next three years. **Suzlon** also announced it will be launching new turbines for low wind – speed zones across India. In April, **Siemens** announced plans to build its first wind turbine plant in India in a bid to generate better margins in a fast-growing market.

Geothermal

Interest in India's geothermal potential has increased in recent months in anticipation of a new national policy. The Government has identified at least 10.6GW of power that could be generated from heat trapped underground and the constant supply is an advantage over more intermittent renewable sources. In Q1, energy solutions provider, **Thermax**, secured a contract to set up the first-ever geothermal power plant, and the Government is also planning a 100MW project in Reasi and other areas.

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Country focus - UK



Solar FIT cuts undermine investor confidence

Ranking	Issue 29	Issue 28
All renewables index	6	5 ¹
Wind index	2 ¹	2
Solar index	20	16 ¹

¹Joint Source: Ernst & Young analysis

Policy

During the first quarter of the year, the UK solar market was shaken by DECC's decision to conduct an early review of the FITs awarded to solar PV projects. A comprehensive review of the scheme will be completed by the end of the year and implemented on 1 April 2012, but a "fast-track" review of installations over 50kW announced in March, only a year after the FIT was introduced, has resulted in dramatic cuts, due to come into effect on 1 August 2011.

The revisions to the solar incentive scheme have had a further reaching impact than the Government perhaps expected, having adversely affected investors' confidence in the stability of the coalition Government's green policies and impacting the ability of renewables developers to make medium- to long-term investment decisions. The current uncertainty is exacerbated by the ongoing review and fine-tuning of the proposed EMR, and DECC's earlier than planned consultation on new ROC banding levels, due to begin mid-2011.

It is perhaps therefore not surprising that, in a report by the **Pew Environment Group**, the UK was relegated from 3rd place to 13th in a table of the top 20 investment economies, attracting US\$3.3b (€2.3b) of private investment in renewable energy in 2010, compared with US\$11b (€7.8b) in 2009.

Budget

The coalition's March Budget announced a number of "green" measures that have generally been welcomed by the sector, including the introduction of a carbon floor price for electricity and the launch of the Green Investment Bank (GIB) a year earlier than planned and with £2b (€2.3b) increased funding. However, neither are without contention. Some analysts assert that the 2013 carbon floor price of £16 (€18.2) /tonne is too low to galvanize real investment in green energy. Meanwhile, the GIB will initially be reliant on the Treasury and will only be able to borrow from 2015 onward, raising concerns that the initiative may be "missing the point" by creating a bank that cannot borrow.

Renewable heat incentive (RHI)

The quarter was not, however, all doom and gloom for the UK renewables sector. The UK successfully launched its £860m (€978m) RHI on 10 March, the world's first such program to incentivize on-site renewable heat production from sources such as solar water heating, biomass boilers, geothermal and energy from waste. The first phase will be rolled out this year and will focus on industrial and commercial customers; the second phase will offer the same long-term tariff support to households from

October 2012. As an interim measure, however, households will be eligible to receive the "Renewable Heat Premium Payment," a £15m (€17m) fund set aside in the scheme's first annual budget to promote early domestic take-up from July 2011 onward.

Onshore wind

The latest GWEC wind statistics show that the UK installed 504MW of onshore wind power in 2010, taking total onshore capacity to 3.9GW. The National Renewable Energy Action Plan estimates a further 11GW of onshore wind is needed to meet the UK's 2020 target; the required annual installation of around 1.2GW would be more than double the 2010 installation. Further, grid connection bottlenecks continue to create project delays.

Offshore wind

The latest wind figures show that the UK was once again the global leader of offshore wind developments, installing 458MW in 2010 to reach a cumulative capacity of 1.3GW. According to **MAKE Consulting**, the UK currently has a project pipeline of around 50GW, of which 33GW relates to Round 3 developments. The UK's offshore wind market continues to demonstrate strong growth, and experiences less acute planning and connection barriers compared with onshore projects. **E.ON**, for example, has recently secured approval from DECC for its 230MW Humber Gateway offshore wind farm.

Solar

In March, DECC announced the following revisions to FIT rates for solar PV projects over 50kW, with effect from 1 August 2011:

New tariffs		Original tariffs		Reduction
Capacity	Rate	Capacity	Rate	%
50-150kW	£0.19 (€0.22)	10kW-100kW	£0.33 (€0.37)	-42%
150-250kW	£0.15 (€0.17)	100kW-5MW	£0.31 (€0.35)	-51%
250kW-5MW	£0.085 (€0.10)			-72%

The revised rates aim to ensure that the now limited budget is preserved for the domestic rooftop market over ground-mounted or large-scale rooftop installations. This has led to the termination of many commercial, and indeed public sector, schemes, with the market already having witnessed a mass exodus of planned projects where installation and connection by the end of July is deemed to be unlikely.

DECC may now find it difficult to reignite enthusiasm for the scheme with the public and investors. Industry players argue that large-scale projects are necessary to drive down the technology's cost curve, and some are also asking why the UK failed to predict the strong uptake given the experience of other European solar markets, which were forced to slash their support for solar in 2010 as a result of higher than expected demand.

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Country focus – Ireland



Green IFSC to act as a hub for green finance

Ranking	Issue 29	Issue 28
All renewables index	14 ¹	11 ¹
Wind index	10	9
Solar index	32	27

¹Joint Source: Ernst & Young analysis

Policy

In late January, the Irish Government announced its support for the Green International Financial Services Centre (IFSC), a new initiative that aims to position Ireland as a specialist in the management of carbon and green finance. Ireland considers itself a world leader in fund administration and asset financing, given the success of the IFSC to date; information published by the Irish Funds Industry Association in February indicated that total assets under administration is fast approaching the €2t mark. The country intends to build on this success to provide high-quality services in respect of funding renewable energy generation, energy efficiency measures, carbon credits trading, and water and waste projects. It is anticipated that there will be growing demand for such services in the next decade or so and Ireland intends to be at the forefront.

It is also hoped the initiative will serve as a means of generating high-value employment and revenue growth in the country, by leveraging the huge commercial opportunities that are emerging in the sector; for example, global carbon trading volumes are expected to reach US\$1t (€0.71t) by 2020. The initiative includes the creation of a government-supported International Carbon Standard and an associated Dublin International Voluntary Offset Registry, which will aid the IFSC's goal of acting as a hub for green finance.

However, Ireland's domestic finances continue to cause some concern for potential renewable energy project investors, as it is still suffering the aftermath of the recession which has swept across Europe. In February, it was revealed that Ireland had received the first €3.6b of a rescue package from the European Financial Stability Facility.

Corporate news

International fund manager, **BlackRock**, has formed a "strategic relationship agreement" with Irish renewable energy group, **NTR Energy**, in a bid to diversify its portfolio and establish a renewable energy investment group. The new group will aim to combine **NTR's** experience in renewable power infrastructure development with the global fund management and distribution capabilities of **BlackRock**, which manages US\$3.2t (€2.7t). **NTR's** current CEO, Jim Barry, will move over to **BlackRock** along with 10-12 other staff to head up the new "investment platform," which will be 100% owned by **BlackRock**, although **NTR** will retain specific economic interests. The new group will be headquartered in Dublin, with offices in London and New York.

Wind

The latest wind statistics from GWEC show that Ireland installed 118MW in 2010, taking total installed capacity to around 1.4GW. This is slightly down on the 233MW installed in 2009. The fact that the best wind resources are on the west coast of the island puts increasing pressure on the country's grid infrastructure, since the main source of demand lies in the east.

Wave and tidal

ESB International, a subsidiary of the state-owned Electricity Supply Board, has applied for licenses to explore two potential wave energy sites off Ireland's west coast. The country is seeking to generate 500MW from ocean energy by 2020 and, according to Irish utility, **Bord Gais Eireann**, Ireland's ocean energy industry could eventually be worth as much as €120b. **ESB** is planning to install a 5MW project at one of the sites to enable the company to conduct marine surveys and resource measurements.

Irish ocean wave power company, **Wavebob**, and Spanish technology company, **Abengoa**, have recently announced a collaboration to work on the research, development and commercialization of wave energy systems in the area. **Openhydro** and **Bord Gas Energy** have also formed a JV focused on the development of a utility-scale tidal farm off the coast of Ireland. Research by **Vattenfall** in recent years shows Ireland to be at the center of an "ocean energy hotspot" in the North Atlantic, and it is clear that investors are starting to explore this potential. The tariff awarded for wave and tidal electricity is currently €0.22/kWh.

Geothermal

Ireland is continuing to seek diversification in its energy mix, with **SLR Consulting** having received planning permission to develop and operate Ireland's first geothermal power plant. The planning permission for the 4.5MW plant in County Dublin was obtained on behalf of **Newcastle Energy Ltd**, a subsidiary of Irish geothermal company, **GT Energy**.

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Country focus - Poland



Energy law amendments in the pipeline

Ranking	Issue 29	Issue 28
All renewables index	14 ¹	16 ¹
Wind index	11 ¹	13
Solar index	26 ¹	22 ¹

¹Joint Source: Ernst & Young analysis

Policy

Poland's Ministry of Economy is currently considering amendments to the country's energy law in a bid to meet its commitment to generate 15% of energy from renewable sources by 2020 under EU Directive 2009/28/EC. The proposed changes would introduce a separate Renewable Energy Act and are anticipated to be approved in the second quarter of 2011, although the industry has some doubts about this timeframe.

The new legislation is expected to amend the existing incentive scheme for renewable energy. Poland currently operates a quota system with green certificates (GCs), with energy producers receiving one green certificate per kWh regardless of the technology. Under the new law, it is proposed that differentiated subsidies be introduced to reflect the following variables:

- ▶ Type of energy source and technology: the Ministry of Economy has indicated that the provision of GCs could vary between 0.8 and 1.2 GCs per kWh produced depending on the technology.
- ▶ Installed power capacity: it is expected that small-scale generation plants will benefit more from the new scheme.
- ▶ Remaining useful life of the assets: the subsidy level will be relative to the depreciation of the electricity generating assets. Those with a shorter remaining useful economic life would attract less support.

The new legislation, provided it tangibly increases government support for renewable energy, could be a much needed boost for Poland's energy sector. Preliminary data released by the Polish Association of Wind Energy indicates that RES accounted for 6% of the energy mix in 2010, lower than the target of 7.5%; this has cast some doubt on whether the country will be able to meet its binding 2020 target. The slowdown in 2010 could be attributed to a less than favorable amendment to the energy bill that requires developers to pay an upfront grid interconnection fee of PLN30 (€7.5) per kW. The main aim of the amendment was to limit speculative action in the reservation of interconnection power for wind farms.

Grid

The new law is also expected to present a regulatory solution in respect to grid connection costs. There are no clear and transparent rules for determining and allocating costs between grid operators and power producers. Clarification of who should incur the costs necessary to modernize the grid is significant, given grid capacity constraints are a major factor in hindering the continued growth of the renewables sector, especially wind.

The Polish wind market remains constrained by the lack of transmission lines in the highest wind resource areas, especially across the Baltic Sea region in the north, where significant expansion of the network is necessary. The Polish grid operator, PSE, has developed a plan through to 2025, focused on upgrading the existing transmission lines in order to meet electricity demand and to integrate renewable power plants into the Polish infrastructure. The plan includes extending this infrastructure with inter-connections to Sweden and neighboring Baltic States.

Wind

The Polish wind market experienced a record year in 2010, adding 382MW - more than twice the capacity added in 2009 - to take cumulative installed capacity to more than 1.1GW. This positions Poland among the top eight countries in the EU in terms of total installed capacity. According to **MAKE Consulting**, Poland has more than 300MW of projects under construction and a solid pipeline of more than 8GW.

Poland's wind resource is significant; the Institute for Renewable Energy estimates capacity could reach up to 13GW in 2020, including 1.5GW offshore capacity. The Baltic Sea offers attractive sites for offshore developments and, while there is no installed capacity to date, a number of projects are in the early planning stages. However, limitations may arise from the protected nature reserve areas, weak grid infrastructure in the north and various administrative barriers.

Investments in the country's wind market continue to be steady, with companies such as **Acciona** and **RWE Innogy** announcing project developments in Q1, potentially attracted by Poland's incentive scheme. In 2010, the average GC price was worth €0.068/kWh, plus a power price of around €0.05/kWh.

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Regional focus – the Nordics

Renewables steam ahead

Sweden

Ranking	Issue 29	Issue 28
All renewables index	11	11 ¹
Wind index	11 ¹	12
Solar index	26 ¹	22 ¹

¹Joint Source: Ernst & Young analysis

Denmark

Ranking	Issue 29	Issue 28
All renewables index	22	21 ¹
Wind index	19 ¹	20 ¹
Solar index	30	26

¹Joint Source: Ernst & Young analysis

Norway

Ranking	Issue 29	Issue 28
All renewables index	24 ¹	23
Wind index	19 ¹	20 ¹
Solar index	34	29

¹Joint Source: Ernst & Young analysis

Finland

Ranking	Issue 29	Issue 28
All renewables index	30 ¹	29 ¹
Wind index	25 ¹	29
Solar index	35	30

¹Joint Source: Ernst & Young analysis

General

The Nordics are characterized as a region well ahead in the development of renewable energy. The region is in many aspects considered a forerunner, as a large part of the Nordic energy supply already comes from renewable energy sources. This is evidenced by Sweden's position as the EU leader in terms of renewable energy consumption, with more than 40%, while Norway has positioned itself as a world leader with more than 43% renewable energy consumption.

The Nordics are building on this leadership position by committing to achieve new and even more ambitious goals through the EU's new Renewable Energy Directive.

Policy

Based on the 2009 EU Directive on promoting the use of renewable energy (2009/28/EC), the Nordic governments recently established new national targets for renewable energy, the main points of which comprise:

- **Sweden:** increasing the share of renewable energy to at least 50% of total energy consumption in 2020, and increasing the share of renewable energy within the transportation sector to at least 10% in 2020

- **Finland:** increasing the share of renewable energy to 38% by 2020 based on a change in the current subsidy and wider incentive mechanisms
- **Denmark:** increasing the share of renewable energy to 30% of the total energy consumption in 2020, and establishing a new international electricity transmission network between Germany, Denmark and Sweden – a project that has been granted EU subsidies of DKK1.1b (€0.15b)

As the only non-EU country, Norway has been negotiating RES targets with the EU. These targets are expected to be even higher due to Norway's current high renewable energy share. Recently, the Norwegian Government proposed financing 13.2TWh of new renewable energy before 2020. However, nothing has yet been finalized.

Overall, long-term innovation and development in renewable energy sources is a major political focus area. This is especially evident from the ambitious country-specific goals that significantly exceed EU's demand for increasing the share of renewable energy consumption to 20% before 2020.

In December 2010, Sweden and Norway agreed on a joint and innovative green electricity certificate system to become effective as of January 2012. The aim is to increase the generation of renewable electricity by 25TWh by 2020 compared with 2002, and for the total annual trade in electricity certificates to be in the order of SEK4.5b (€0.5b).

The system is designed so that producers of renewable electricity will receive a certificate for each MWh of electricity they produce. In order to create a demand for certificates, electricity suppliers must buy a certain amount of certificates in relation to their electricity supply, i.e., the quota obligation. Producers receive additional revenues based on the sale of certificates, which improve financial returns for renewable electricity generation. Only Norway and Sweden currently use this electricity certificate system.

Onshore wind

Growth in the Nordic onshore wind market is expected to be driven by new projects in Sweden and Finland, and to some extent in Norway, where current hydropower resources are near their maximum capacity.

Sweden has just completed its largest annual expansion to date with approximately 603MW of onshore wind power. There are currently 220 onshore turbines under construction, with an estimated capacity of 500MW.

The political climate supports the onshore growth expectations, as Sweden's 2020 aim is to increase its annual production of wind energy to 30TWh (20TWh onshore and 10TWh offshore). Furthermore, in December 2010 the Finnish parliament accepted a new FIT law supporting wind energy. The tariff became effective in March 2011 after EU approval and forms part of the Finnish Government's 2020 goal of reaching 6TWh of wind energy a year.



Regional focus – the Nordics

Finally, the largest Nordic wind producer, Denmark, has a history as a pioneering onshore wind farm nation. However, a near saturation of the market and a weak overall economic environment mean the market is not expected to grow more than 5% in the coming few years.

Offshore wind

Offshore wind is seen as the real growth sector in Denmark, and as such, it is the leader in the Nordic region, with a current installed capacity of 665MW. The largest offshore wind farm is currently Horns Rev II, with an installed capacity of 209MW. In February, the Danish Government announced that the offshore wind farm at Kriegers Flak will be the next wind farm to be made available for a public tender. This will be the biggest offshore wind farm in the Nordics, with a capacity of 600MW.

In mid-2010, **DONG Energy** was awarded the public tender to build and operate the 400MW Anholt offshore wind farm, which will be finished in 2012.

In Sweden, offshore activity is picking up, and there are currently 60 offshore wind turbines in operation with an installed capacity of 130MW. Sweden's existing 110MW Lillgrund wind farm is one of the world's largest offshore wind producers, and a further 339 offshore wind projects are currently planned, with a total installed capacity of 1,685MW.

In Finland and Norway, there are offshore projects in the planning phase, but progress is slow, predominantly due to an insufficient tariff structure. Despite this, they do recognize the potential and Norway is developing several test sites at six different locations.

Biomass

In parts of the Nordic region, bioenergy plays an important role in achieving 2020 targets, and is therefore a current market focus. In Denmark, the largest increase in energy consumption (between 2009 and 2010) of all renewable energy sources came from bioenergy. Currently, bioenergy accounts for around 30% of total renewable electricity consumption in Denmark.

In Sweden, bioenergy production has increased significantly due to the introduction of the electricity certificate system. Today, close to 60% of the renewable energy in Sweden comes from bioenergy, with an expected supply of 125TWh in 2011. Bioenergy will contribute significantly to reaching the 2020 national targets for renewable energy, and the Government has implemented a number of measures, including tax reductions, investment support and sustainability plans to increase the attractiveness of biomass.

In Norway, bioenergy does not have the same focus in terms of reaching the long-term political goals, but the Government has previously stated that its goal is to double the bioenergy production before 2020. Today, bioenergy accounts for a smaller percentage (around 11%) of total renewable energy consumption.

Hydro

Hydropower as an energy source accounts for a large part of the combined use of renewable energy, especially in Norway and Sweden.

Sweden currently has an estimated installed capacity of 16.2GW, distributed between 1,800 plants, while the Norwegian power system is also dominated by hydropower, producing more than 120TWh a year. Both countries are only expecting to expand small-scale, run of river, hydro projects.

In Finland, hydropower accounts for a smaller proportion (3%-4%) of the combined energy consumption and 12%-15% of the total renewable energy consumption. There is still potential for expanding hydropower in Finland but, as most resources are already being used, the potential lies in the expansion of existing plants.

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New country focus – Morocco



A fast-growing market with strong resource potential

Ranking	Issue 29	Issue 28
All renewables index	27 ¹	n/a
Wind index	31	n/a
Solar index	9 ¹	n/a

¹Joint

Source: Ernst & Young analysis

Policy

With no domestic oil reserves, Morocco relies on oil and coal imports to meet 95% of its energy needs. Energy demand is projected to double by 2020 and triple by 2030, therefore the Government is keen to improve the security of domestic supply and reduce the impact of energy price volatility.

Morocco has been promoting renewable energy since the 1980s, but in recent years has pursued it more vigorously as a means of liberalizing its energy sector. The Government has created a plan that aims to generate 20% of electricity from RES by 2012, increasing to 42% by 2020. This will take installed electrical capacity from the current 6.1GW to 14.6GW in 2020. In recognizing the huge resource potential, the Government launched major wind and solar programs that both aim to install 2GW of electricity capacity by 2020, requiring investment of more than €8b in renewable energy over the next decade.

In 2010, the Moroccan Government also introduced a number of renewable energy laws to support its ambitious energy targets. This included the breakup of the monopoly over the production of RES electricity by state-owned Office National de l'Electricité (ONE), creating a more liberalized market to encourage RES generation by the private sector (although the obligation to supply RES power through the national network still applies).

The Ministry of Finance has been very vocal in its opposition to FITs, claiming there is no reason to subsidize industries that cannot compete directly, and instead operating a competitive bidding process. While this benefits the national economy by reducing subsidy costs, there are concerns that the absence of a financial subsidy system supporting RES production could discourage investors. However, some private investment incentives do exist: the EnergiPro initiative encourages industrial players to invest in RES projects <50MW to meet their own energy needs, with guaranteed access to the grid and incentive tariffs for any excess electricity produced.

There is significant potential for generating renewable energy in Morocco; however, the country admits it is heavily reliant on foreign investment to help it harness and exploit these resources, requiring both project expertise and financing capacity.

Grid

Morocco is currently the only African country with a direct interconnection into Europe, specifically the 1.4GW capacity Gibraltar Strait link with Spain. The country also has an interconnection with Algeria and there are plans to connect to Mauritania. Morocco is keen to increase opportunities for

integration and cooperation with European markets, and has already signaled it would consider exporting a portion of its renewable energy. This could help facilitate "joint projects" to support EU countries' ability to meet their 2020 targets. The domestic grid, however, is likely to require reinforcement over the coming decade to support the ambitious energy targets.

Wind

Morocco's wind power potential is significant, with average annual wind speeds of 8-11m/s in the north of the country and an estimated technical potential of around 1,600GW as shown in a study undertaken by the Center for Renewable Energy Development. The study indicated around 4GW-7GW of wind power could be installed between now and 2020, requiring an investment of up to US\$14b (€9.9b).

At the end of 2010, installed wind capacity totaled 286MW across four projects, 33MW of which was installed in 2010 compared with 119MW in 2009. However, as part of the 2GW target by 2020, an estimated 720MW is under construction by the private sector, and an additional 1,000MW is being tendered by ONE as part of a US\$3.5b (€2.5b) integrated wind energy program. Bids have already been received for the first phase of this project. While Morocco has significant coastal exposure, the wind resource is insufficient to support offshore developments.

Solar

Morocco has abundant unexploited solar resource, generating annual solar irradiation of 2300kWh/m² and around 3,000 hours of sunshine each year. To date, only one 20MW CSP plant has been commissioned as part of a 470MW hybrid gas plant in Ain Beni Mathar, and solar PV capacity is equally low at only 13MW.

However, in November 2009, the Government launched its US\$9b (€6.4b) solar plan to install 2GW of solar capacity by 2020, mainly through the construction of five large CSP facilities. Once complete, the solar projects will provide 18% of Morocco's annual electricity generation. The first plant – a 500MW facility at Ouarzazate – will be the world's largest solar plant and is due to be operational by 2014. Both private and public funds will be used to finance the project, but the state has confirmed it will guarantee any price gap. The European Investment Bank (EIB) is also currently considering a €500m loan to help fund the first stage of this ambitious solar project.

Hydro

Morocco's hydropower capacity totals approximately 1.2GW and 30MW for large- and small-scale projects respectively, contributing a reasonable proportion of the country's current renewables mix. However, the potential is almost exhausted.

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New country focus – Taiwan



Strong solar supply chain and offshore potential

Ranking	Issue 29	Issue 28
All renewables index	30 ¹	n/a
Wind index	28 ¹	n/a
Solar index	24 ¹	n/a

¹Joint

Source: Ernst & Young analysis

General

Taiwan is heavily reliant on imported fossil fuels, owing to the lack of indigenous energy resources. To increase its energy security and take advantage of abundant renewable resources, the Government has recently set ambitious targets to promote both the generation and manufacturing of renewable technologies. The Government is committed to establishing 6.5GW-10GW of renewable energy by 2020.

Policy

In 2009, the Government announced the Renewable Energy Development Act (REDA) to increase investment and make regulations more flexible. The Act aims to stimulate renewable energy generation from 5.9% in 2009 to 16% by 2025. The Act introduced FITs to help renewables compete with fossil fuel alternatives and created a Renewable Energy Development Fund, which places a requirement on utilities supplying fossil fuel and nuclear power to contribute. In the REDA, the Government committed to an investment of NT\$45b (€1.09b) to boost industry growth figures from NT\$160.3b (€3.9b) in 2008 to NT\$1,500b (€400b) by 2015, with an initial focus on solar energy manufacturing.

Grid

Taiwan has a strong grid network as a result of an estimated US\$12b (€8.8b) investment over the past decade by state-owned and managed utility, **Taipower**, with an additional planned investment of US\$1.75b (€1.3b) per year over the next five to six years. **Taipower** has a monopoly over the grid network and is required to purchase electricity generated from renewables at a guaranteed price.

Onshore wind

Taiwan has considerable wind resources and by the end of 2010 had installed 506MW, representing 1.27% of installed renewables capacity. Onshore wind capacity is expected to increase between 100MW-150MW per year until 2015, with an ambitious target of 2.5GW by 2025. Industry growth has recently been stimulated by a 10% increase in tariffs from US\$0.082 (€0.06) to US\$0.09 (€0.064) per kWh.

Despite the ambitious targets, the onshore wind industry could be limited by Taiwan's mountainous landscape and high population density near the coast.

Offshore wind

With abundant offshore resources and limited land mass for onshore wind development, offshore wind is central to the Government's long-term renewable energy plans. At the start of 2011, the Government increased the tariff by 30% to US\$0.192 (€0.14) per kWh to help facilitate market growth. The Ministry of Economic Affairs expects the value of investment in the supply chain to reach NT\$1.5b (€0.04b) per year from 2010, with Danish producers such as **Vestas** looking to take advantage of the Government's ongoing support. Scotland's **SeaEnergy** and **Taiwan Generation Corp** are developing the first commercial project in waters off Changhua County. The US\$1.2b (€0.9b) investment is set to deliver 600MW of power.

Solar

Taiwan's geography is less suited to mass installation of PV cells and, as a result, solar PV currently represents only 0.19% of installed capacity in the renewable energy mix. REDA set ambitious targets of 2GW by 2025, although a 30% reduction in tariffs at the start of 2011, to reflect declining production costs, may stall the industry. Investors will now receive NT\$7.33 (€0.184) per kWh for power generated from ground-mounted solar installations, compared with NT\$11.12 (€0.279) for 2010. Rooftop installations will receive NT\$10.32 (€0.26).

In contrast, solar cell manufacturing dominates the PV industry in Taiwan. At the end of 2009, it produced 2.6GW of cells to rank fourth globally behind China, Japan and Germany. Continued demand in Europe and North America should maintain this export-led growth of the industry.

Geothermal

Owing to its position on the edge of the Pacific Ring of Fire, Taiwan has the potential for 715MW of geothermal potential, with the majority of this (500MW) in Northern Datun.

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New country focus – Bulgaria



New RES legislation focuses on sustainable growth

Ranking	Issue 29	Issue 28
All renewables index	32	n/a
Wind index	32	n/a
Solar index	21	n/a

Source: Ernst & Young analysis

Policy

Bulgaria is heavily reliant on nuclear power and coal as its main energy sources; however, accession to the EU in 2007 imposed a target of 16% of energy from renewable sources by 2020, prompting the introduction of various RES incentives. Prior to the recent adoption of a new Renewable Energy Act, these included mandatory purchase of RES electricity at preferential prices, priority connection of RES power to the grid, long-term PPAs and limited annual FIT adjustments, e.g., tariffs were set at 80% of the average price for the preceding year, plus a margin that cannot be less than 95% of the margin in the previous year.

These measures have produced strong growth in RES output in recent years, increasing 67% in 2010 alone. The country's Energy and Economy Ministry is confident of meeting its 2020 target, recently announcing that RES accounted for 15% of total energy output in 2010, exceeding the 11% target set by the EU.

However, the surge in RES development has put additional strain on an already aging grid infrastructure. Connection requests significantly exceed current grid capacity and projections indicate the grid could collapse or experience national blackouts in coming years if measures are not taken to address the issue.

In a bid to reduce pressure on the national grid and incorporate Bulgaria's obligations under EU Directive 2009/28/EC, the Government has prepared a new energy strategy through to 2020. The new Renewable Energy Act Law, initiated in 2009 and approved on 21 April 2011, is designed to create a more sustainable energy market. The new law retains the FIT system; however, a quota system will limit the number of projects that will receive these fixed prices under long-term PPAs. Further, the FIT term will be reduced from 15 to 12 years for wind projects and from 25 to 20 years for solar projects. The size of the annual quotas and the allocation process remains unclear.

The new law also states that tariffs will be fixed when the facility is built rather than when the preliminary PPA contract is signed as previously. Further, no cap is proposed on FIT adjustments. This means investors may be unable to calculate revenue and payback profiles before actually commencing construction of the plant. The law also requires investors to pay an upfront connection fee of around €25/kW, in order to strengthen guarantees the project will go ahead.

The Government claims these measures will discourage speculation and determine which investors are serious about RES development, as well as speeding up project delivery. However, many in the industry are disappointed, claiming the law will

restrict new investments and introduce financing issues as a result of shorter PPA periods and the anticipated reluctance of funders to start construction without an agreed PPA price.

It is therefore likely that growth across Bulgaria's RES sector will slow in the short term relative to recent years. However, the Government claims the new law will create more sustainable growth, and the country's strong natural resources and low operating costs are likely to make it an attractive market in the long term.

Wind

Bulgaria's wind market is supported by an attractive incentive scheme and good wind resources, especially in the northeast. Installed capacity increased 112% in 2010 to reach a total of 375MW. Mid-term potential is estimated to be around 3GW and the Government is seeking to reach around 1.3GW by 2020.

In 2010, the FIT scheme offered €0.097/kWh (up to 2,250 hours) and €0.088/kWh (more than 2,250 hours). Installations smaller than 800kW received €0.074/kWh. However, onshore wind market activity remains relatively low to date, due to limited transmission lines in attractive development areas and legislative uncertainty. While Bulgaria has coastal exposure to the Black Sea, offshore wind potential is limited and no projects are planned.

Solar

Bulgaria has a relatively attractive solar resource; annual mean irradiation is 1200-1600kWh/m², with the strongest resource areas comparable to conditions in Northern Spain. Installed capacity was only 10MW-15MW at the end of 2010, but the 2020 target requires 303MW of electricity capacity. Current FIT rates are €0.420/kWh and €0.386/kWh for capacity up to and exceeding 5kW respectively.

Other

Hydropower currently represents 95% of renewable generation, although large hydro potential is almost fully exploited. It is predicted there will be greater emphasis on small hydro in coming years, which attracts a FIT of €0.054/kWh. Bulgaria has more than 550MW of installed capacity from small-scale hydro plants.

There are currently no commercial-scale biomass energy plants in Bulgaria; however, technical potential is estimated at 3.4GW, as 90% of the country is arable, agricultural or forest land. Biomass attracts a FIT of €0.085-€0.11/kWh over a 20-year PPA.

Bulgaria has a sizable reserve of geothermal energy, although it is mainly used for space heating and greenhouses. The resource is not considered strong enough to generate power on a commercial scale, with maximum potential of only 200MW.

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New country focus – Chile



High levels of natural resource hindered by policy

Ranking	Issue 29	Issue 28
All renewables index	34	n/a
Wind index	33	n/a
Solar index	26 ¹	n/a

¹Joint

Source: Ernst & Young analysis

General

Renewable energy has become a focus of government attention over the past couple of years as Chile seeks to diversify its energy sources amid supply shortages in the mid-2000s. Chile's stable economic growth and high electricity prices make it one of South America's most attractive countries for investment, with investors currently favoring onshore wind and small-scale hydro.

The earthquake in early 2010 caused power failures and heavily damaged distribution infrastructure but has, for the most part, not affected Chile's projected 6% annual increase in electricity demand. Just weeks after the natural disaster, Chilean President, Sebastian Piñera, announced an ambitious renewable energy target of 20% by 2020.

Policy

However, Chile has no FIT or GC system and relies on free market competition between private companies, with little state intervention. This has put renewables at a disadvantage as they compete on a purely economic basis with conventional sources of power.

In 2004, the Government passed a law that provided guaranteed grid access for renewable sources of power. This was further supplemented in 2008 with the Non-conventional Renewable Energy law that requires utilities to supply 5% of their power from renewables between 2010 and 2014, with an annual increase of 0.5% thereafter until it reaches 10% of supply in 2024. However, the law has proved to be an ineffective growth stimulus due to the lack of clarity over premium tariff rates paid by utilities. In light of this, the Government is drafting new legislation that would provide tradable green certificates to spur investment.

Grid

The two largest grid systems are in the north (SING) and central (SIC) regions of Chile, the latter serving most of the Chilean population. Despite providing guaranteed grid access and reduced transmissions tolls for small-scale generators, the rich renewable energy sources have yet to be fully exploited due to transmission constraints and the long distance from generation sites to major load centers.

Hydro

Chile is seeking to exploit the 20GW of hydropower potential by increasing the construction of mini-hydropower plants. Hydropower already plays a significant role in Chile's energy mix, representing half of the installed capacity of the SIC transmission line. The Government is leaning toward the nascent mini hydro sector (only 36 projects to date) as larger projects face increasing environmental scrutiny. To overcome the ubiquitous problem of poor transmission, industry representatives are working with the Ministry of Mines and Energy to develop a single transmission line for small-scale renewables.

Wind

An estimated 40GW of wind potential exists in Chile, but by the end of 2010 there was only 172MW of installed capacity due to transmission and investment constraints. Under the Chilean Economic Development Agency's program to facilitate investment in renewables, there are currently 48 projects in the development pipeline.

Solar

The Atacama desert of northern Chile has some of the world's highest solar energy potentials, owing to its minimal cloud cover and low humidity. As an indicator of the potential that exists, Santiago-based, **Atacama Solar**, has applied for a permit to develop a 250MW solar CSP plant in the Atacama region by 2018, with an estimated investment requirement of US\$773m (€548m).

Geothermal

Situated on the Pacific Ring of Fire, Chile has a high level of volcanic activity, providing opportunities for geothermal exploration. The largest project to date is being developed by Italian utility, **Enel**. The 40MW plant is expected to come online in the next few years.

At the end of 2010, the Chilean Ministry of Energy issued a request for proposals to award concessions to geothermal exploration in 21 new areas.

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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 off-take 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 or 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).

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' view on each market and the forecasts used are a market view only – the scores in no way guarantee that the forecast capacity will be built.

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.

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Glossary

Abbreviation	Definition
b	Billion
BNEF	Bloomberg New Energy Finance
CAI	Country Attractiveness Indices
CDB	China Development Bank
CES	Clean energy standard
CLO	Collateralized loan obligations
CSP	Concentrated solar power
DECC	Department of Energy and Climate Change
DOE	Department of Energy
EIB	European Investment Bank
EMR	Electricity Market Reform
EPA	Environmental Protection Energy
EU	European Union
FIT	Feed-in tariff
FYP	Five-year plan
GC	Green certificate
GIB	Green Investment Bank
GL	GL Renewables Certification
Goldwind	Xinjiang Goldwind Science & Technology Company
GW/GWh	Gigawatt / gigawatt hour
GWEC	Global Wind Energy Council
IEX	Indian Energy Exchange
IFSC	International Financial Services Center
IPO	Initial public offering
IPP	Independent power producer
JV	Joint venture
JST	Japan standard time
kW/kWh	Kilowatt / kilowatt hour
m	Million
MENA	Middle East and North Africa
MW/MWh	Megawatt / megawatt hour
NDRC	National Development and Reform Commission
NERSA	National Energy Regulator of South Africa
NEX	New energy global innovation index
NSM	National Solar Mission
OECD	Organisation for Economic Co-operation and Development
ONE	Office National de l'Electricité
PMDD	Permanent magnet direct drive
PPA	Power purchase agreement
PV	Photovoltaic
PXIL	Power Exchange India
R&D	Research and development
REC	Renewable energy certificate
REDA	Renewable Energy Development Act
RES	Renewable energy sources

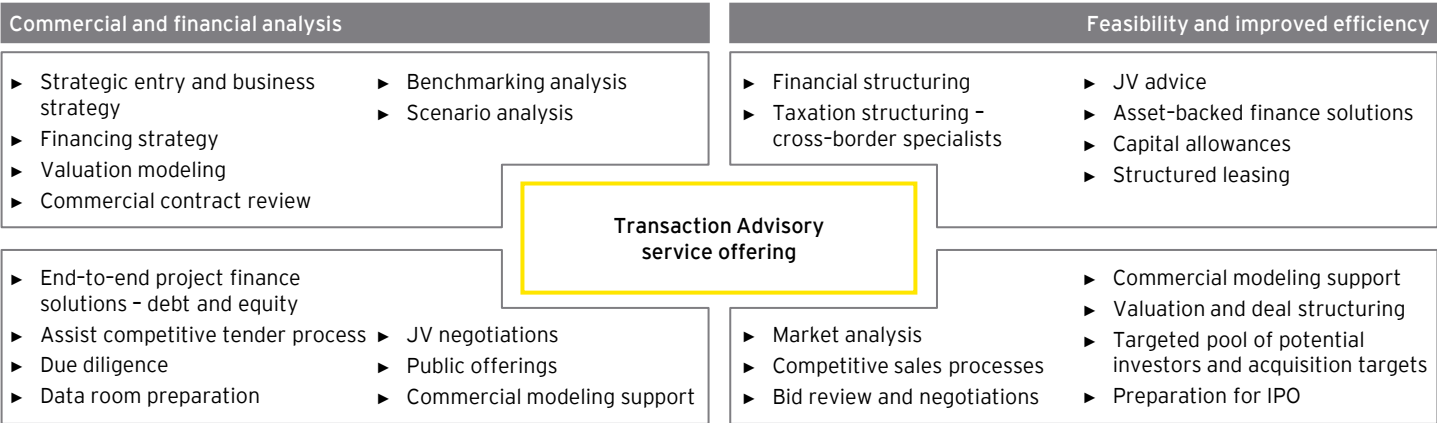
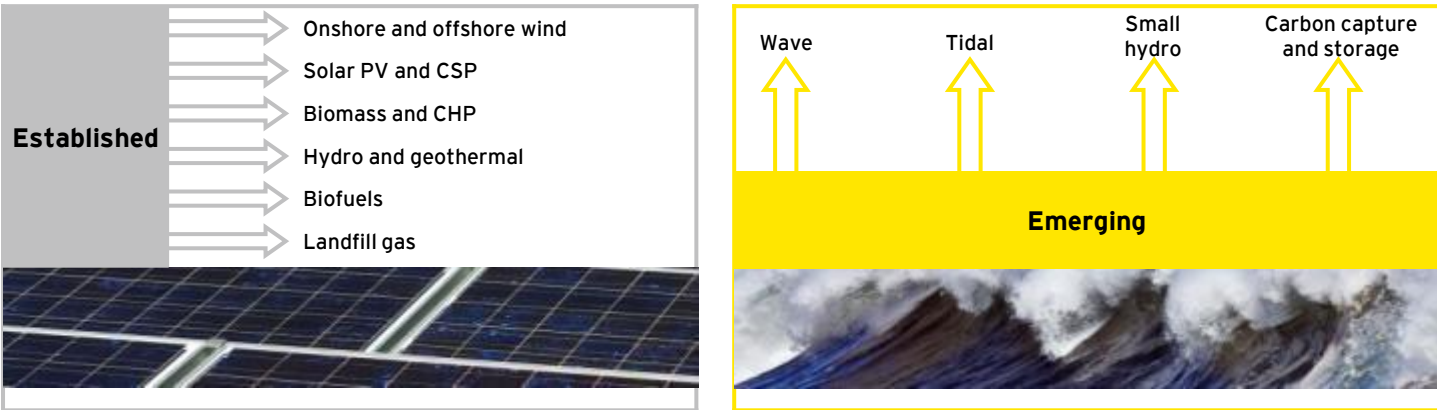
Abbreviation	Definition
RHI	Renewable heat incentive
RO	Renewables Obligation
ROC	Renewables Obligation Certificate
RPS	Renewable portfolio standard
Suzlon	Suzlon Energy Limited
t	Trillion
TW/TWh	Terawatt / terawatt hour
UK	United Kingdom
US	United States
WTG	Wind turbine generator

Ernst & Young services for renewable energy projects

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With a dedicated team of over 100 international advisors operating from our global team, Ernst & Young’s Renewable Energy Group helps clients to increase value from renewable energy activity.

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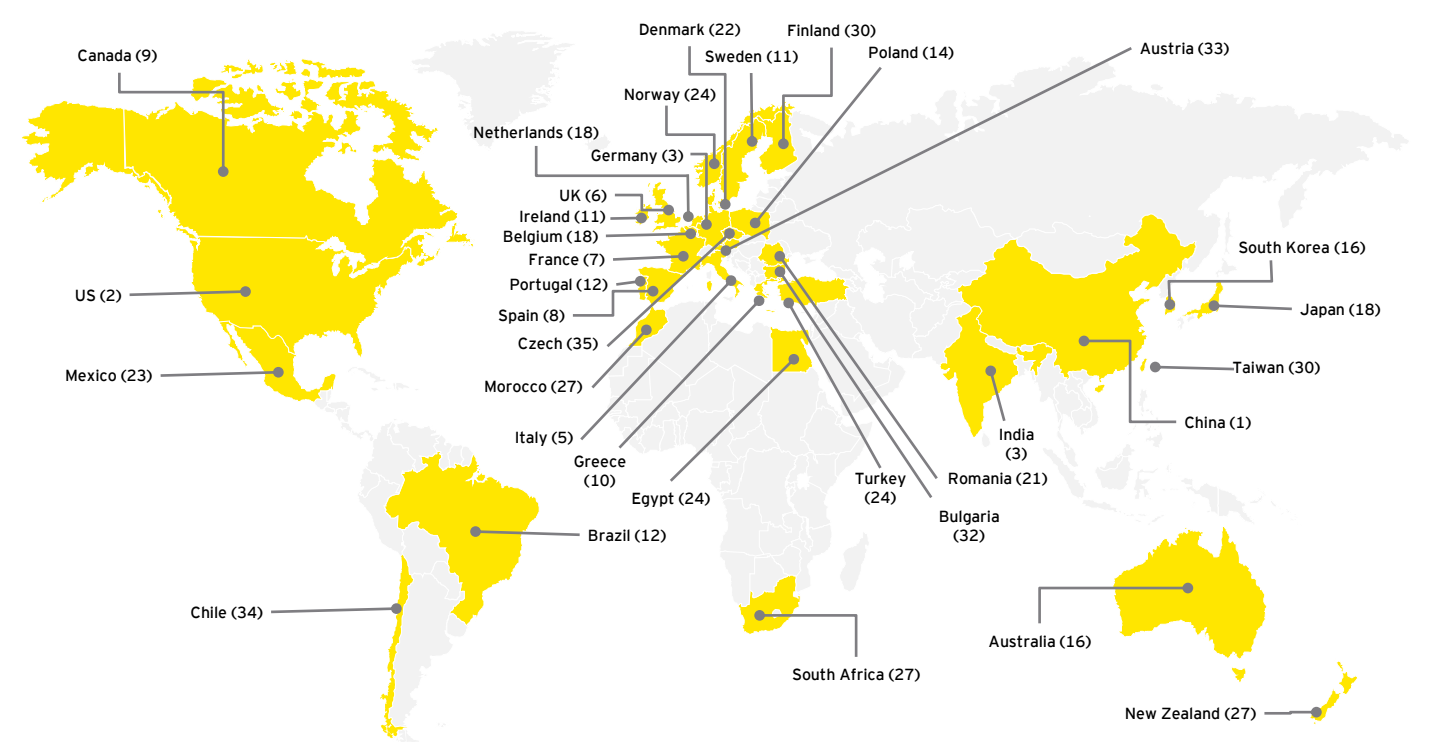
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Map highlighting CAI countries and their respective Issue 29 rankings



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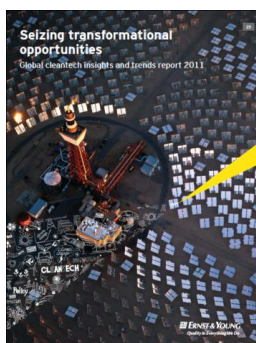
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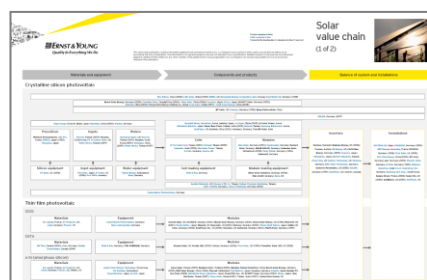
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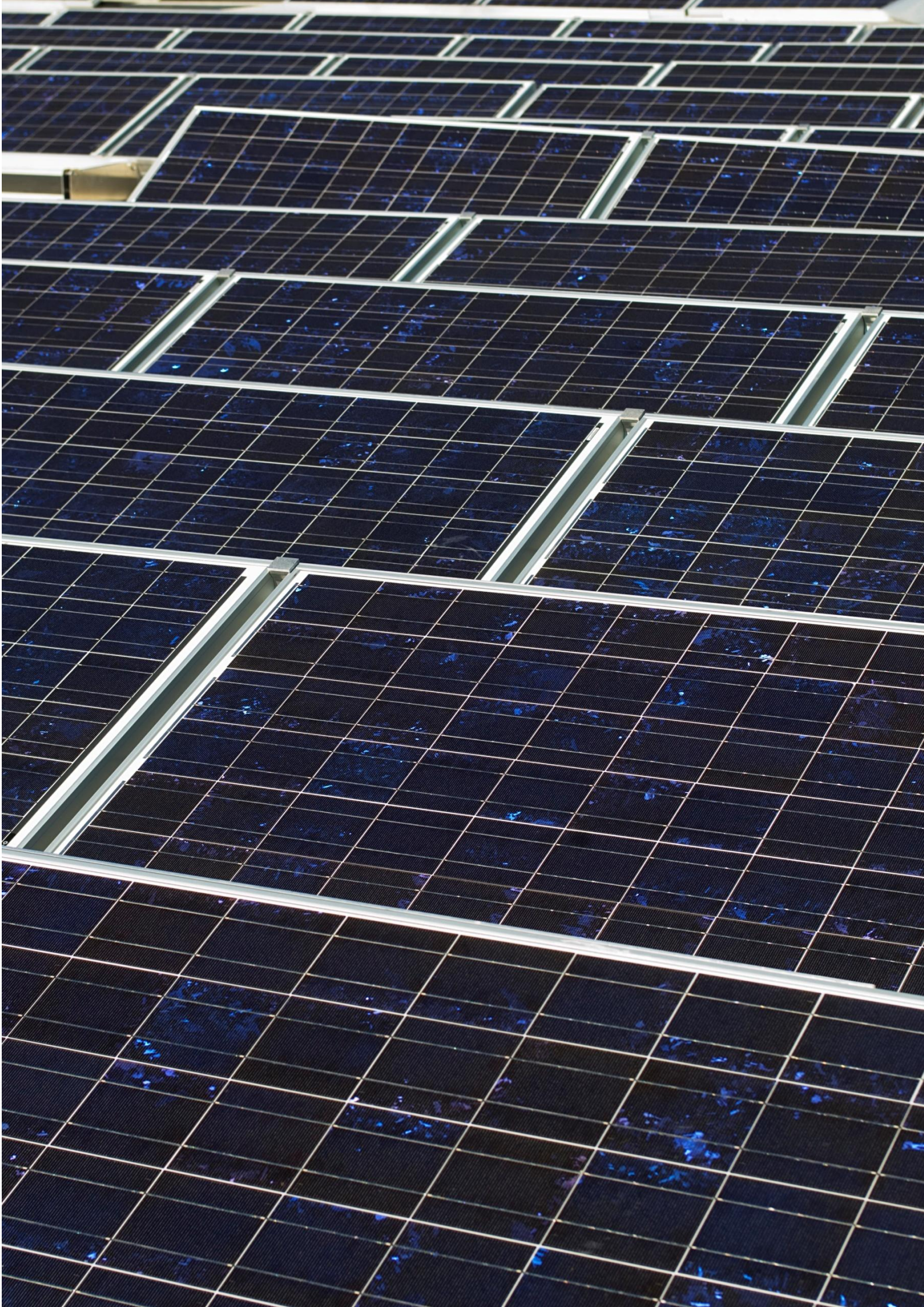
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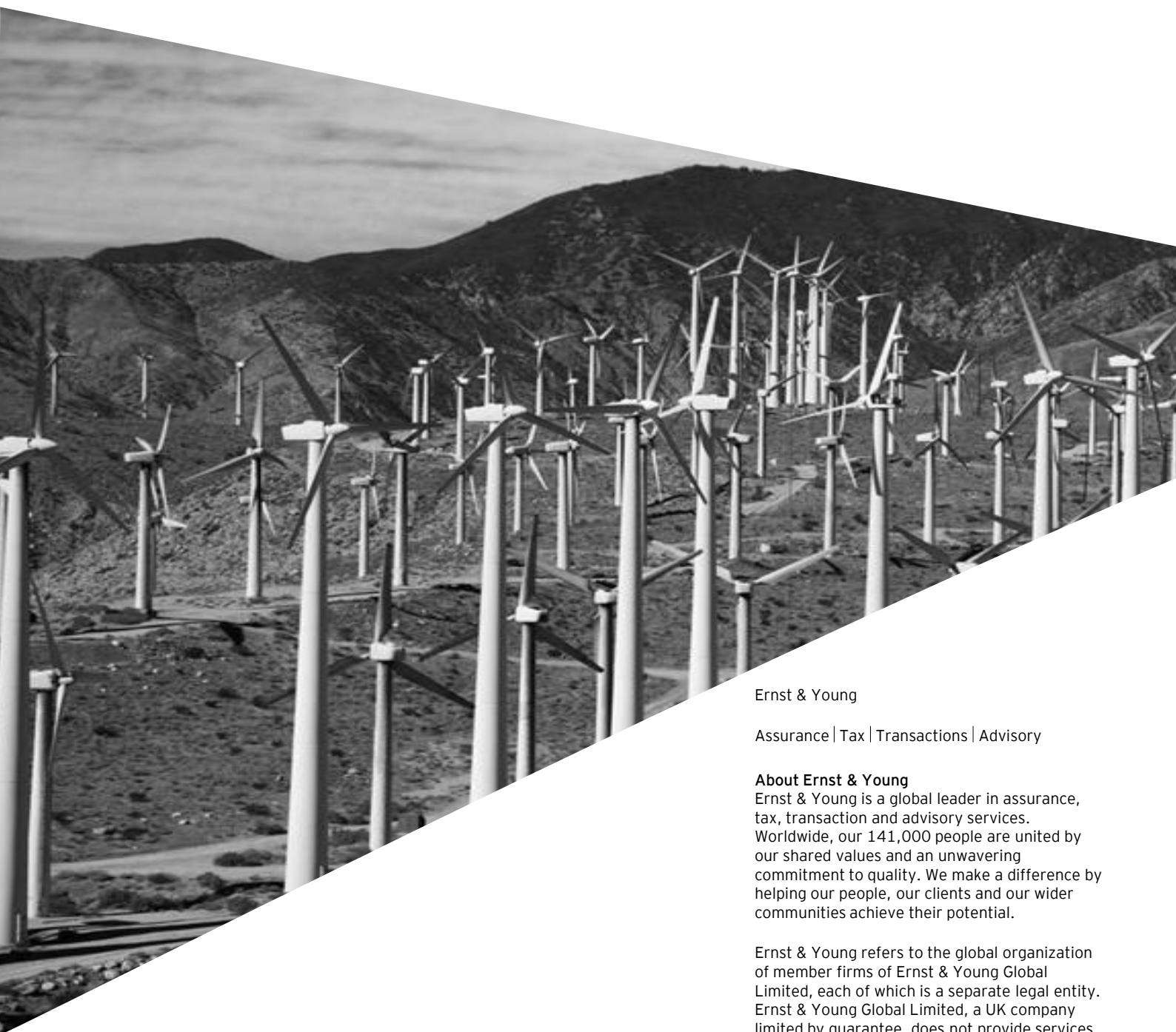
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