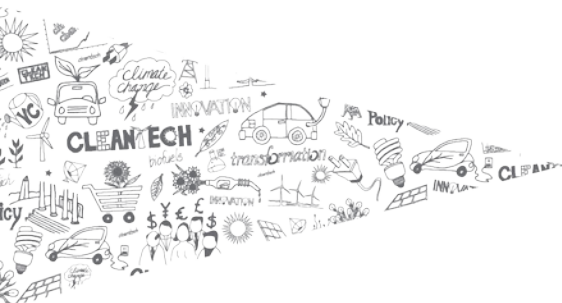


# Renewable energy country attractiveness indices



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## Global highlights

Following a record year in 2011, investment flows in clean energy in the first quarter of 2012 were the weakest since the depths of the financial crisis three years ago.

The global renewable energy sector continues to be hit by multiple storms that are changing its landscape, reflected by a noticeable reduction in the gap between developed and emerging markets in our Country attractiveness indices (CAI). In the West, public policy support is being reduced due to fiscal challenges, while developing countries are introducing new incentive mechanisms and implementing national energy strategies.

Global activity is being stimulated by the rapidly improving cost competitiveness of renewable technologies – the price of solar PV modules, for example, fell by 50% in 2011. However, the sector continues to face significant challenges: the Eurozone debt crisis and reduced policy support across core European markets, competition from Asia, decreasing carbon prices, and in the US, tax credit uncertainty and a shale gas boom. As more mature technologies move ever closer to achieving grid parity, it is increasingly likely that the renewable energy sector will flourish in the long run. However, in the face of such challenges, the short-to medium-term outlook is more bleak.

While the rankings at the top of the all renewables index (ARI) remain unchanged, all five of the top ranking countries have lost points in the ARI this issue. China's wind sector continues to suffer from insufficient grid access, while a boom-bust scenario has returned to the US as a result of uncertainty over the expiry of key stimulus programs. In Germany, another round of solar tariff cuts and grid challenges for the offshore sector reduce short-term attractiveness, while the end of a key tax break incentive in India is likely to dampen wind sector growth through 2012. Further cuts to the preferential rates awarded to renewable projects in Italy completes the trend across the top five countries.

However, the news was more positive in other parts of the index, with several countries including Mexico, Chile and Austria announcing new national targets for clean energy generation or reaffirming commitment to government support through incentive schemes. In Poland, for example, a rapid U-turn on a bill to remove guaranteed power prices for renewable projects is an acknowledgment of the importance of the market. This issue also sees Japan climb in the CAI following its rapid recovery from the Fukushima nuclear disaster and the announcement of favorable feed-in tariff (FIT) levels as policy setters encourage new investment with renewed vigor.

This issue's lead article summarizes the results of an Ernst & Young global survey of 100 US\$1b companies. The elevation of energy efficiency, use of renewable energy and self-generation as key strategic issues at the C-suite level of billion-dollar corporations suggest that only those with a comprehensive and diverse energy strategy will be able to create competitive advantage in an increasingly resource-efficient and low-carbon world.

Also this issue, we introduce a new regular feature, with a deep dive into the solar and energy efficiency supply chains. Each issue will see other subsectors featured on a revolving basis. This issue also includes a technology feature focusing on emerging marine technologies and, following the severe debt crisis in Ireland, we look at how the cleantech sector has fared and what opportunities this presents going forward. Finally, we hope you enjoy the separated transactions and finance and equity trends analysis.

# Overview of indices: Issue 33

The Ernst & Young 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 advisors can provide detailed studies to meet specific corporate objectives. It is important that readers refer to the guidance notes set out on page 35 referring to the indices.

## Forward-looking indices

The ARI and technology-specific indices are forward looking and take a long-term view (up to five years). This time period forms the basis of both quantitative and qualitative analysis.

## All renewables index

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

1. Wind index – 55% (comprising onshore wind index and offshore wind index)
2. Solar index – 32% (comprising solar photovoltaic (PV) index and concentrated solar power (CSP) index)
3. Biomass and other resources index – 13%

## 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 35).

## Technology factors

These provide resource-specific assessments for each country.

## Long-term wind index

This index is derived from scoring:

- ▶ The onshore wind index – 80%
- ▶ The offshore wind index – 20%

## Long-term solar index

This index is derived from scoring:

- ▶ The solar PV index – 85%
- ▶ The solar CSP index – 15%

For parameters and weightings, see page 35.

Ernst & Young was ranked the leading project finance advisor in the Americas, Europe, Middle East and Africa between 2001 and 2011 by **Project Finance International**.

Also ranked Renewables Financial Advisor of the Year and Power Financial Advisor of the Year by **Infrastructure Journal** for 2012.

## 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](http://www.ey.com/renewables) or [www.ey.com/CAI](http://www.ey.com/CAI) or contact either:

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Bloomberg subscribers can access historical CAI scores through the Ernst & Young Renewable Energy – Total Renewable CAI page: {EYRE<GO>}. Each value can be evaluated to reveal history.

# Billion-dollar corporations prioritize energy mix strategy

**Ernst & Young guest columnists – John de Yonge and Phil Dominy**

**Global survey reveals focus on efficiency, increasing use of renewable energy and growing self-generation**

The largest global corporations are meeting the challenge of the transition to a low-carbon and resource-efficient economy with proactive energy strategies involving the C-suite level. Improving energy efficiency to mitigate further energy cost hikes, increasing use of renewable energy and growing energy self-generation form the foundation of corporate energy strategies worldwide. These are some of the key findings arising from Ernst & Young's recent global energy mix survey of billion-dollar corporations.

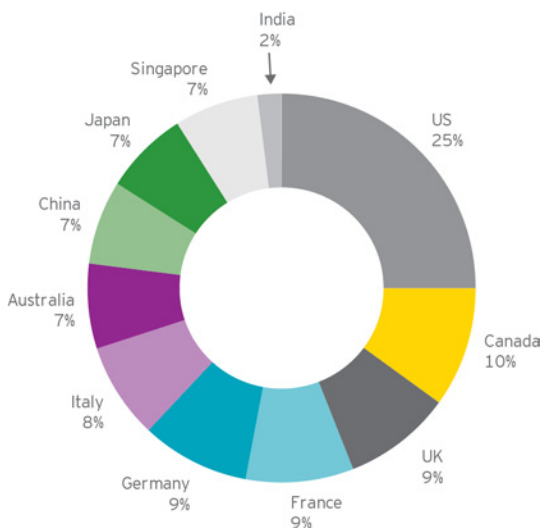
## Global energy mix survey

Ernst & Young worked with a market research firm to conduct a telephone-based survey of executives involved in setting corporate energy strategy at 100 companies with revenues of US\$1b or more. Questions focused on energy spend, types of energy consumed, energy strategy formulation and outlook.

The company population was limited to those in energy-intensive sectors with a balanced distribution around the globe. In the final tally, 72% of the responding companies have revenues exceeding US\$1b and another 28% with revenues of US\$10b or more. Survey respondents are mostly spread between North America (35%), EMEA (35%) and Asia Pacific (30%). The largest industry groups are diversified industrial products (29%), retail and wholesale (16%) and automotive (9%).

While our survey was conducted at arm's length to ensure the participants' confidentiality and anonymity, respondents who opted to disclose their participation include British Airways, Celgene, Goodyear Tire & Rubber Company, Magna International, Arvind Ltd, China Southern Airlines, Marks & Spencer Group and Rete Ferroviaria Italiana SpA.

Figure 1: Survey respondents by country



Source: Ernst & Young global energy mix survey

## High energy costs

High energy costs that are expected to increase even further set the context for the discussion of corporate energy mix strategy. For half of our survey respondents, energy expenditure represents 5% or more of their operating costs. A smaller but significant subset (22%) report that 20% or more of operating costs go toward energy.

In absolute terms, this translates into an annual energy spend of at least US\$50m for 40% of respondents. Nearly a third (27%) spend US\$100m or more on energy.

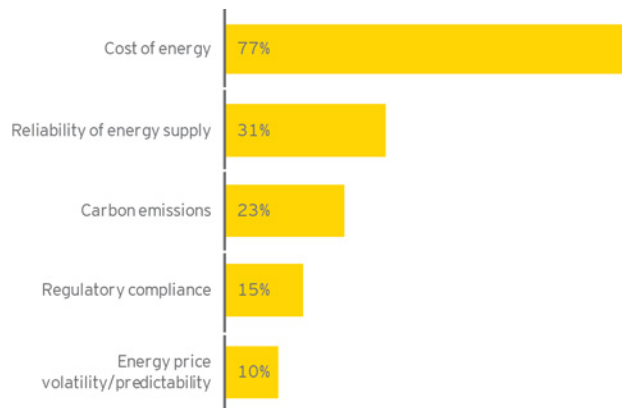
The majority (73%) of our respondents foresee their already substantial energy costs rising over the next five years. A large percentage (38%) expects that energy costs will rise by 15% or more in this period.

## Formal energy strategy and implementation plan

Given these high energy costs, it is perhaps no surprise that the majority of respondents (70%) have a formal strategy and implementation plan in place to manage the mix of different energy sources used. Slightly over half (51%) have a strategy that applies to their company globally; 46% say that energy strategy applies at the country or business unit level.

Interestingly, 16% of respondents report that their energy strategy is not limited to their own operations but also extends to their supply chain.

Figure 2: Key drivers for energy mix



Source: Ernst & Young global energy mix survey

# Billions-dollar corporations prioritize energy mix strategy (cont'd)

## Energy strategy objectives

Asked to comment on the objectives of their energy strategies, the majority of respondents indicated that cost reduction through efficiency was the primary objective of the energy mix strategy. Energy conservation and minimization of carbon footprint followed cost reduction as other key objectives. Many companies have targets to meet a portion of their energy needs from renewable sources through implementation of their energy mix strategy. Ensuring reliability of energy supply is another key objective.

## Key implementation challenges

Respondents identified financing and capital issues related to energy mix projects as the most important energy strategy implementation challenge:

- ▶ Financing and capital issues related to energy mix projects (47%)
- ▶ Identifying and accessing government grants and incentives (40%)
- ▶ Assessing and selecting technologies (39%)
- ▶ Measuring or tracking progress in meeting energy mix strategy objectives (37%)

## Energy strategy objectives – respondent comments

“To see how energy costs will develop over the next two to three years and to ensure high level of [energy] security.”

“First, to reduce energy use; second, to increase the usage of renewable energy.”

“To phase out older technology and equipment, replacing it with it more energy-efficient equipment.”

“To help us achieve three targets: to reduce energy consumption by 15%, to reduce greenhouse gases by 20%, and to increase renewable energy mix by 5%.”

## C-suite input and oversight

Energy mix strategy decision-making is not limited to procurement or facilities management functions but rises to the highest levels of the corporation. For over a third of respondents (36%), the CEO is the final energy mix strategy decision-maker. For another 40%, energy mix strategy is decided by the COO, CFO, GM or board chairman. Energy mix is a truly strategic issue for the world's largest corporations and receives high-level executive attention as a result.

## Company energy self-generation

A number of well-known large corporations have launched initiatives to generate their own energy for a variety of reasons, such as reducing energy price volatility, increasing security of supply, decreasing costs or meeting carbon objectives. Example companies with their own renewable energy generation include IKEA, Google, Toyota, Toshiba, Hertz, FedEx, AT&T, BMW, Renault, VW, Audi and PepsiCo. VW, for example, is investing €1b in offshore wind projects to meet renewable energy objectives and provide a natural hedge against volatile energy prices.

Our survey suggests that this practice is not yet widespread, but likely to grow over the next few years. Just over half (51%) of respondents report no self-generation at all and only 20% of respondents generate more than 10% of their firms' total energy needs. That said, a third of respondents expect to meet a greater share of their energy needs through self-generation over the next five years.

## Key barriers – return and risk concerns

Asked why they had opted not to invest in self-generation capacity, the leading reason given is that the payback period is too long for such investments. Survey respondents also highlighted financial return and risk concerns.

Factors such as the upfront investment amount, the company's level of experience with energy projects, site availability and technology readiness are relatively unimportant, suggesting that the right financial models could unlock corporate investments in energy generation.

Figure 3: Primary reasons for not investing in self-generation



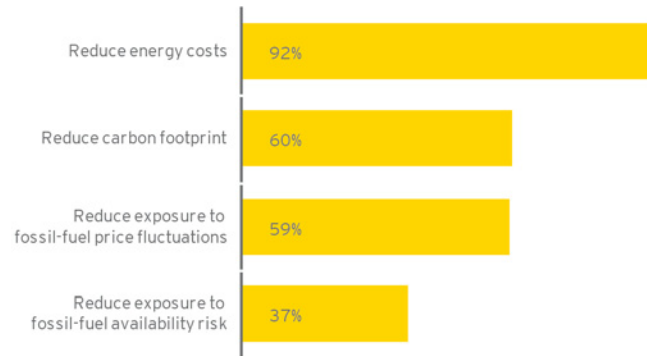
Source: Ernst & Young global energy mix survey

If you would like assistance with optimizing your corporate's renewable energy strategy, please contact Phil Dominy: Tel: +44 1392 284499 Email: pdominy@uk.ey.com

## Energy efficiency

Given current energy spending and anticipated increases, reducing energy costs remains the nearly universal primary objective of energy efficiency initiatives. However, important secondary objectives include shrinking the company's carbon footprint, limiting exposure to fluctuating fossil fuel prices and reducing risk related to fossil fuels availability.

Figure 4: Top energy efficiency objectives



Source: Ernst & Young global energy mix survey

Respondents deploy a variety of technologies to achieve their energy efficiency objectives. The most important ones are energy demand management (47%), building energy management systems (20%), energy efficiency lighting (18%) and building automation (18%).

A large majority of respondents anticipate increasing energy efficiency over the next five years; 60% say that initiatives to reduce energy consumption through efficiency will increase and another 22% say that such initiatives will significantly increase.

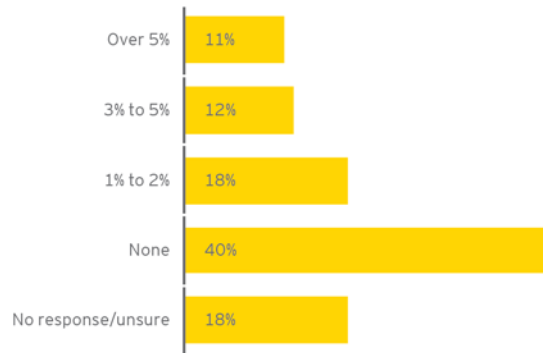
## Use of renewable energy

Our energy mix survey examined the use of renewable energy from two perspectives: energy generated by company-owned or controlled assets; and energy purchased from outside parties. From either perspective, the survey indicates that renewable energy usage among large corporations is set to increase over the next five years from an already substantial base.

### Renewables in company energy self-generation

Whether solar, wind, bioenergy or other kinds of renewables, 41% of respondents report generating some form of renewable energy with company-owned or controlled resources. The greatest number of respondents generate power with photovoltaic solar (25%), followed by biomass/biogas generation (20%) and the use of biofuels in company-owned fleets (19%). Wind and geothermal have 7% uptake.

Figure 5: Renewables as a percentage of company generation



Source: Ernst & Young global energy mix survey

However, renewable energy still makes up a relatively small proportion of total company generation. Only 11% of respondents say that renewables account for more than 5% of their companies' total energy production.

Although corporate renewable energy generation can be said to be currently wider than it is deep, this looks set to change:

- ▶ Across the total survey population, 51% of respondents say that company-owned renewable generation would increase over the next five years.
- ▶ Another 16% expect renewable generation to increase significantly.

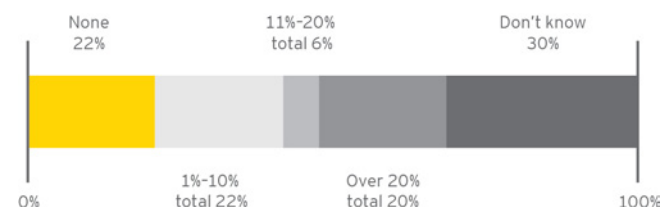
This suggests that additional corporations will test the waters of renewable generation in the near future and the ones currently just dipping their toes will become more deeply involved.

### Renewables in purchased electricity

In contrast to company-owned generation, the majority of respondents (68%) purchase some electricity generated from renewable sources. In terms of total consumption, this population divides itself into those who consume just a little renewable electricity and those who consume a lot (figure 6).

Pricing remains a key factor in the adoption of renewable energy. Only 39% of all respondents say that they would be willing to pay a premium for renewables, highlighting the importance of achieving grid parity and developing innovative project financing models.

Figure 6. Renewables as a percentage of purchased electricity



Source: Ernst & Young global energy mix survey

Nonetheless, as with corporate self-generation, survey respondents predict growing use of renewables in purchased electricity over the next five years; 46% say that their use will increase and another 9% say it will increase significantly.

# Billions-dollar corporations prioritize energy mix strategy (cont'd)

## Energy audit issues

Survey respondents were invited to comment on the key issues revealed in their companies' latest energy audit. Taken together, the energy audit issues revealed the difficulty of implementing a global energy mix strategy. Common challenges highlighted by the respondents include:

- ▶ Need to develop a structured approach to meeting energy targets
- ▶ Developing a greater focus on implementation of energy conservation programs
- ▶ Better understanding of energy usage profile
- ▶ Improvement in monitoring and tracking energy metrics
- ▶ Understanding scope to increase the proportion of self-generated energy and procured renewable energy in the mix
- ▶ Better understanding of technology to optimize efficiency and replace aging or low-performing equipment
- ▶ Maintaining energy security in terms of both supply and cost
- ▶ Funding and access to capital

## Conclusions

Energy mix has become a strategic issue at the C-suite level of billion-dollar corporations, as a significant (and rising) share of operating costs go to energy. While reducing energy costs through energy efficiency measures is often the foremost objective of an energy strategy, a number of other subsidiary goals are also driving strategy, such as energy security, carbon reduction and price stability. Regulatory compliance together with reputational and brand aspects also play a part.

Company self-generation of energy and integration of renewables into the energy supply have been adopted at significant rates to meet these ends, with adoption set to accelerate over the next five years. The main barriers to self-generation and renewables adoption are mainly related to risk and financial return, suggesting that adoption could come even faster with financing innovations and increasing cost-competitiveness of renewables. In summary, only those corporations with a comprehensive and diverse energy strategy will be able to create a competitive advantage in the new world of a more resource-efficient and low-carbon economy.

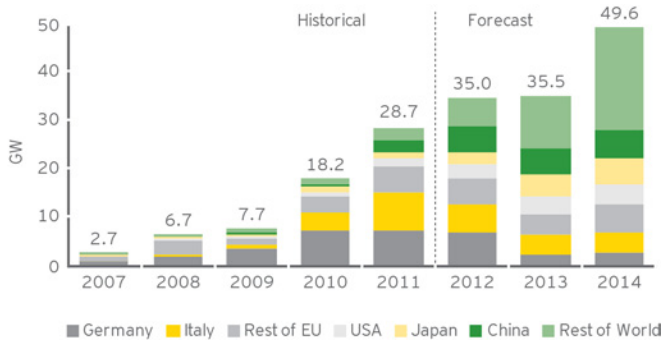
# Recent trends in solar power

Co-authored by Ernst & Young and Bloomberg New Energy Finance (BNEF)

Solar module manufacturers face intense price and margin pressures, with system prices still falling as competition intensifies between engineering, procurement and construction firms. We expect the hot topics in the next five years to include innovations in finance; the onset of residential grid parity; and the trading of large project portfolios.

The growth of the PV industry – in MW terms – has been spectacular over the last three years, from 7.7GW of installations in 2009 to approximately 29GW in 2011. This was mainly driven by the FIT markets – Germany, Italy, the Czech Republic and the UK – which experienced unsustainable booms. Governments are now reining back these cuts with severe incentive cuts, although there was also growth in the many smaller markets. While there are a few remaining heavily subsidized markets, such as Japan, the US, Ontario and Thailand, there are now dozens of small but more sustainable PV markets in Europe, South America and Asia. While the cuts in Germany and Italy will prevent demand growth in 2012 and 2013, the other new markets are expected to take off, driven by economics suddenly much improved by the sharp and irreversible fall in module prices (Figure 1).

Figure 1: PV installations by year, 2007-11 and optimistic forecast to 2014

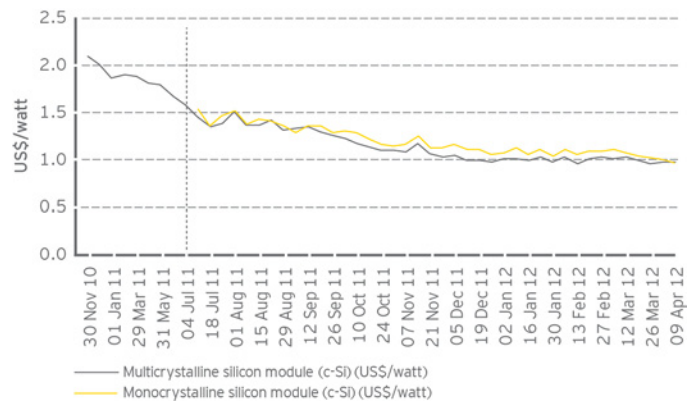


Source: BNEF

The price of solar modules has stabilized since the end of 2011 (figure 2), with multicrystalline silicon modules costing about a dollar per watt (although there are quotes as low as US\$0.70 (€0.50) on the market). This is unsustainable for many manufacturers (figure 3) and a new wave of bankruptcies has begun, with German thin-film pioneer Odersun and German crystalline silicon cell maker Q-Cells – the world’s largest cell maker in 2007 – declaring insolvency. BNEF expects at least half the manufacturers currently in existence to consolidate, either through bankruptcy or acquisition.

There are already some signs of manufacturers merging in China, with Jiangsu Shenlong acquiring Hareon for US\$368m (€276m), Zhejiang Narada acquiring 51% of Chengdu Guojian New Energy for US\$18.8m (€14.1m) and several other deals involving firms little known in the West. A different example is German cell, module and inverter maker Sunways, which has sold a majority stake to Chinese silicon, wafer cell and module maker LDK. In this case, the €41.9m valuation of Sunways is probably more for its distribution channels and brand than its manufacturing capacity.

Figure 2: Average factory gate price of PV modules



Source: BNEF

Thin-film manufacturers are some of the worst affected by the decline in crystalline silicon prices. Many were in the ramp-up stage, and now find it difficult to sell product, even at a loss, as their warranties are not considered reliable. While thin-film leader First Solar struggles on at reduced capacity utilization and Japanese Solar Frontier, backed by oil firm Showa Shell Sekiyu, has secured new orders, US Department of Energy (DoE) loan guarantee recipient Abound Solar has shut its older manufacturing line already.

The difficulties for manufacturers has stirred up trade tensions, and the US has introduced a preliminary duty of 2.9%-4.73% on Chinese crystalline silicon cells and modules in response to a trade case brought by German Solarworld and some minor US module manufacturers. While this is only a symbolic level of tariff, and Chinese manufacturers will find ways to circumvent it, it has led to some US project developers using Japanese or Taiwanese modules instead of Chinese. It may be another driver for Chinese firms to acquire small Western competitors.

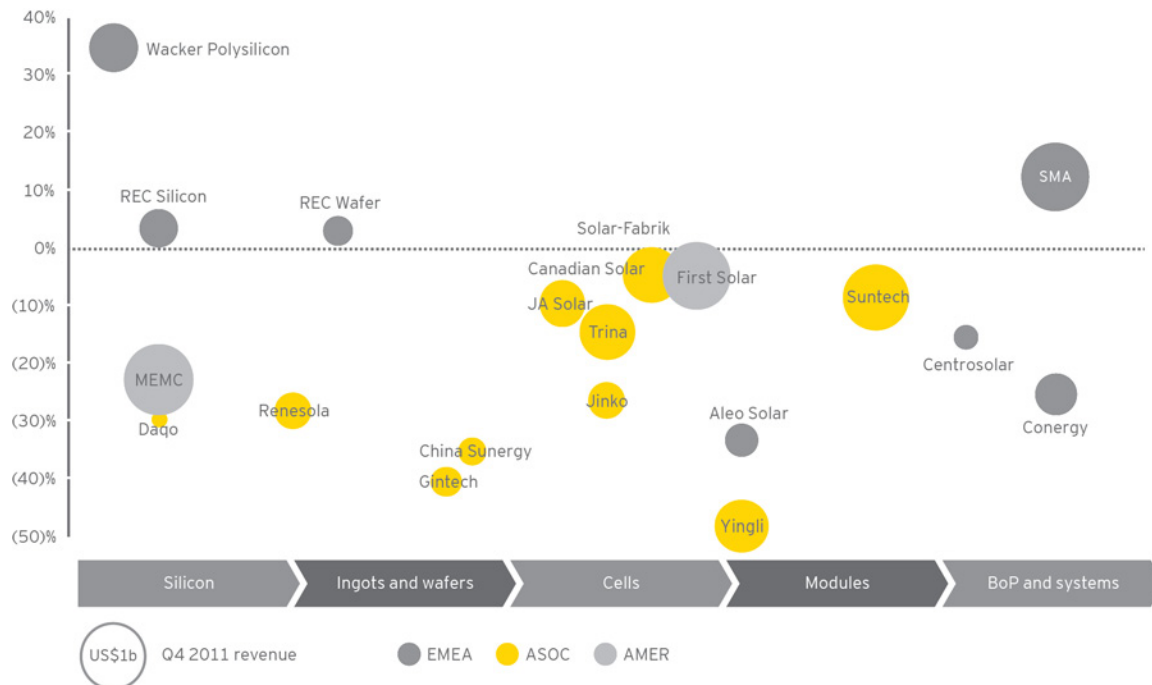
# Recent trends in solar power (cont'd)

The initial public offering (IPO) of microinverter maker Enphase – a manufacturer of a complement to modules, focused on the residential market – managed to get off the ground at a lower price than originally mooted and as of mid-April, was trading well above its float price. Inverter prices are coming down too, but much more slowly than module prices and the BNEF inverter price index shows that utility-scale inverters in March were US\$0.02 (€0.01)/watt cheaper than in December 2011, at US\$0.19 (€0.14)/watt.

While module makers are struggling, solar projects are starting to be understood by mainstream investors as a much less risky asset class, almost independent of whether the supplier stands or falls. Warren Buffett's MidAmerican Holdings sold US\$850m (€637m) worth of bonds to finance the Topaz Solar Farm in California, which it bought from manufacturer and developer First Solar for US\$2.4b (€1.8b). It is likely that there will be a lot more activity in buying, bundling and de-risking large portfolios of solar assets, to float as traded bonds and access pools of capital that can only make liquid investments. We also expect the 1GW Blythe project, under development by the insolvent Solar Trust of America and now to be sold to the highest bidder, to see plenty of interest from developers, investors and manufacturers.

At German system prices – which averaged €2.43/watt including value added tax (VAT) in Q4 2011 for systems below 100kW – householders in Denmark, Italy, Spain, Hawaii and parts of Australia can make over 6% real internal rate of return (IRR) investing in solar systems, provided they manage to use every kWh generated instead of one they would have had to buy. This is technically grid parity at the residential level, or “socket parity,” and it is happening not tomorrow, but today. It will take longer to make unsubsidized large-scale solar projects work, because the cost of electricity to the consumer usually includes a large proportion of transmission and distribution fees, overheads and taxes. However, in a few places, such as Spain, Chile and Mexico, developers are seriously considering going ahead with large projects without subsidy due to high insolation and high electricity prices. The economics here are tight, and will require best practice in every aspect of project development, from filing for permits to engineering to financial structuring. However, the opportunity is only likely to grow as the experience of PV producers continues to push costs down.

Figure 3: EBIT margins of quoted PV companies, Q4 2011, by position in value chain



Source: BNEF



# Global trends in energy efficiency

## Co-authored by Ernst & Young and Bloomberg New Energy Finance (BNEF)

The term “energy efficiency” can refer to a broad range of measures and activities. The market for energy efficient products and services also varies considerably by country and sector. Here, we provide an overview of the key developments for energy efficiency in the world’s major economies.

### Europe: Energy Efficiency Directive

The European Parliament is scheduled to debate the Energy Efficiency Directive (EED) in June. If passed into law, the directive should see a significant increase in activity around energy efficiency across the European Union (EU). The key feature of the EED is that it is likely to focus on *binding measures* rather than *binding targets*. In other words, EU Member States will be held accountable for implementing specific policies and measures related to energy efficiency, rather than whether their energy consumption has hit a certain level.

The cornerstone of the EED is the requirement that Member State governments would be mandated to set up energy saving obligation (ESO) schemes for energy suppliers. Such schemes already exist in several European countries and require energy suppliers to implement or fund measures that will result in energy savings equal to a certain fraction of their annual energy sales (the level will likely fall between 1% and 1.5%). While these are not particularly subtle measures, such schemes lead to significant activity when enacted effectively. We estimate that an ESO set at 1.5% could lead to €160-€320b of additional investment in energy efficiency across the bloc. The key question is how this will be distributed – the design of individual Member State’s schemes will determine which products and business models can be used by obligated parties to save energy under the ESO.

An interesting development in the most recent revision of the EED is the focus on demand response. The directive will mandate Member States to open power reserve and capacity markets to demand response. Member States will also need to include it in all future capacity planning. The US experience shows that, with the right regulatory framework, demand response can scale quickly – in the US it accounts for 35GW of capacity and generates revenues of around US\$1b (€0.7b) per year.

### The United States: financing at a crossroads

The US has arguably the most developed energy services industry in the world, with annual revenues of around US\$4-US\$5b (€3-€4b) from energy performance contracting. The sector faces two major issues, however. Firstly, almost all of the industry’s revenue is generated from government facilities only, which are a small fraction of the total building stock. If energy service companies (ESCOs) could make progress in commercial buildings, the industry could generate annual revenues upward of US\$25b (€19b). Thus, the market is still at only a small fraction of its potential – the fact that the US is a global leader for energy services reflects as much on the failure of the rest of the world as on the success of the US.

The second issue faced by US ESCOs is that the leasing structures available to government agencies – which enable off-balance sheet financing for energy performance contracts – are set to be

revised over the next few years as US accounting standards are harmonized with their international equivalents. The availability of off-balance sheet financing is one of the main reasons the US ESCO industry has been so successful in public buildings, but the niche in which they have thrived is set to become considerably more challenging in the coming years.

Both factors mean that developing new models for financing building retrofits in the commercial sector is not only desirable, but essential for US ESCOs. Several structures are being heralded as the answer. Commercial Property Assessed Clean Energy (PACE) programs, in which the cost of retrofits is repaid through a property’s tax bill, are showing early promise in the counties where it has been piloted (an equivalent model has also proved very successful in South Australia). The Efficiency Services Agreement (ESA), which resembles a power-purchase agreement for saved energy, has also attracted attention. Its principal appeal is that it keeps alive the hopes for off-balance sheet financing (if accounting standards allow). The solution may be altogether simpler than PACE or ESA – Fannie Mae plans to launch an initiative in which it will bracket mortgages by the LEED and Energy Star rating of the underlying assets. This is in the hope that if banks view green buildings favorably, lower interest rates may be available. This in itself may be sufficient to incentivize retrofit activity on a wide scale.

If financiers and ESCOs are unable to find a workable solution to the financing conundrum, energy efficiency in the US will very likely hinge on the Energy Efficiency Resource Standards. These are equivalent to the ESOs being mandated across Europe; crude but effective, they impose a tight regulatory framework for energy efficiency, but guarantee results.

### China pushes toward energy intensity target

Any consideration of energy efficiency in China has to be seen within the context of the energy intensity targets of the Government’s 12th five-year plan. Between the start of 2011 and the end of 2015, China should aim to have reduced its energy consumption per unit of gross domestic product (GDP) output by 16%. Although this target is self-imposed, it is noteworthy that the 11th five-year plan had an equivalent target of 20% which was met (more or less). In that case, the Government resorted to forcing the closure of inefficient production lines toward the end of 2010. The 2015 target is likely to be met, one way or another.

We anticipate that by 2015, expected changes in economic output will have reduced China’s energy intensity by 12%. This leaves 4%, approximately 2,150TWh/year (equivalent to 245GW of baseload capacity running constantly), that will need to be achieved through energy efficiency measures. Specific strategies that the Government has identified to achieve this goal are the addition of 20GW of waste-heat-to-electricity generation (circa US\$30b (€22b) in investment by 2015), improvements in boiler efficiency (circa US\$7b (€5b)) and the retrofit of approximately 500 million m<sup>2</sup> of floor space. We estimate that these actions would reduce consumption by 1,320TWh/year. China’s energy services sector has developed rapidly – there are around 400 Chinese ESCOs that generated revenues of US\$4.2b (€3.1b) in 2010.

# Global trends in energy efficiency (cont'd)

These companies focus on energy-saving projects in the industrial sector – including the implementation of measures such as waste-heat-to-electricity generation and boiler improvements. Given the Government's plans, we expect this sector to continue to grow.

The 12th five-year plan also pledged investment in the development of "key energy saving technologies," including efficient motors, light emitting diode (LED) lighting and heat pumps. The combination of government support and a domestic market for these products gives Chinese companies an advantage over foreign competitors. LED manufacturer Sanan Optoelectronics is an example of this – the company grew its revenues 140% in 2011, benefiting from a combination of government subsidies for manufacturing equipment and large contracts for provision of street lighting. Taiwanese and South Korean rivals do not enjoy these luxuries and mainland Chinese companies, such as Sanan and Xiamen Changelight, are threatening to usurp their status as the "factory floor" of the global LED industry.

## Japan embraces LED lighting

Lighting sales generate approximately US\$40b (€30b) of revenue per year globally, and observers agree that energy efficient LEDs are likely to be the future of that market. For the time being, however, LED lighting is considered too expensive – although the

technology is progressing and prices are dropping rapidly, sales have not taken off, yet. The Japanese market is the exception to the rule. Slightly less than 75% of revenue from ceiling lights sold in the consumer market in Japan this March can be attributed to LED varieties. A year earlier, LEDs were less than 20% of the market. Analysts predict that, in 2012, Japanese LED lighting sales will total US\$4.6b (€3.4b), an increase of 69% on 2011. The surge in uptake can be correlated directly to the Fukushima crisis – the resulting strain on the country's electricity supply appears to have triggered a conscious effort on the part of consumers to reduce their energy consumption however they can.

The healthy domestic market for LED lighting in Japan has implications for the global industry. Nichia is one of the few upstream LED manufacturers (in addition to the Chinese companies mentioned above) that has not seen revenues shrink in the past 12 months. Further down the value chain, the three best-selling LED lighting fixtures are all produced by Japanese companies (Panasonic, Toshiba and Sharp). These "aggregators" are benefiting from a head start in scaling their capacity and progressing along the experience curve for assembling finished lighting fixtures from LED components. By the time other markets reach their tipping points, Japanese aggregators may have already established an unbreakable grip on the downstream of the LED lighting industry.

Figure 1: Operating margin and quarterly change in revenue for selected quoted LED companies, Q4 2011



Source: BNEF

Note: Nichia is not quoted but revenue and profit information has been deduced from income statements. Toyoda Gosei refers to the company's LED profits and revenues only.

# Cleantech on the island of Ireland



## Overview

The world has reached a tipping point in the way it uses natural resources to generate economic growth. After many years of slow but steady progress, the cleantech sector has now been established as a global growth industry that will spearhead the future competitiveness of nations. With US\$260b (€195b) invested in the clean energy sector in 2011 alone, higher than any previous year and despite global economic woes, the private sector is responding to this global challenge, with strong investments in cleantech-related infrastructure and innovation.

Necessity is often the prime catalyst for innovation. In Ireland's case, cleantech opportunities exist because of the unsustainable dependency on energy imports, the emissions challenges that need to be addressed and because the local economic outlook is such that new areas of competitiveness and growth need to be rapidly identified.

The Republic of Ireland and Northern Ireland are well positioned to meet these challenges given the abundant wind and ocean energy resources, the strong and vibrant ICT, engineering and financial services sectors and the comparatively young and highly educated population. They are also able to tap into this rapid global sectorial growth and establish an international competitive advantage through skills and technological innovation.

The island of Ireland, having already achieved 20% wind energy penetration and striving for 40% by 2020, is well positioned to use domestic demand as a catalyst for generating global leadership in the cleantech sector.

## Tackling Ireland's energy challenge

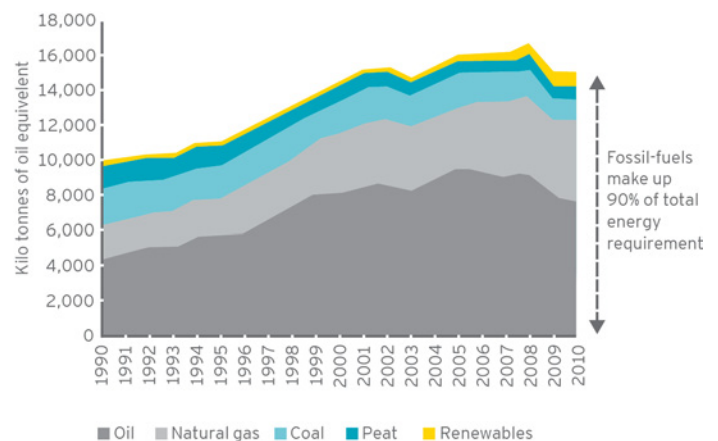
Concerns regarding Ireland's energy security are particularly acute given the paucity of indigenous fossil fuel supply. Over 95% of the total energy requirement is met by fossil fuels, the vast majority of which are imported. The transport sector and buildings are the biggest consumers of this energy. The following facts illustrate the extent of this challenge:

- ▶ Oil remains the dominant energy source in Ireland representing over 50% of the country's energy supply.
- ▶ The country's dependency on imported fossil fuels is high by international standards (fourth highest in the EU at 88% compared with an average of 55%).
- ▶ Total outlay on imported fuels amounted to €5.6b in 2010
- ▶ Almost half of all Irish domestic houses rely on oil for heating purposes.
- ▶ Ireland consumes energy and produces emissions at above-average rates (28th highest CO2 emissions per capita in the world, higher than the EU average).

This heavy dependence on imported fuels leaves the Irish economy extremely exposed to volatile oil and gas prices. This vulnerability is amplified given Ireland's status as a small, open economy.

It is clear that, without a thriving and integrated cleantech sector, it will be very challenging for Ireland to develop a sustainable economic growth strategy, while meeting domestic and international climate change and environmental targets and maintaining current living standards.

Figure 1: Primary energy requirement by fuel type, 1990-2010



Source: Energy Statistics Databank, SEAI

Being in such a position, however, to allow Ireland to develop innovative solutions to address resource scarcity ahead of other countries, and export these skills and solutions to other countries that will face similar challenges in the future.

## The role of renewable energy

A number of studies have concluded that onshore wind energy, which is already generating a fifth of electricity consumed on the island of Ireland, can act as a hedge against high fuel costs by depressing the wholesale cost of electricity. Better energy management through electricity and heat storage and usage, accelerating infrastructure upgrades and incentivizing appropriate ancillary services in the energy sector will allow increased renewable energy penetration. This in turn continues to generate a range of economic benefits – from energy security to emission reductions, economic growth to export revenues.

Private capital has funded most of the installed renewable energy capacity to date, c.2GW, the majority of it on a non-recourse project finance basis and with a FIT. This installed capacity needs to double to meet the 2020 targets of 40% renewable electricity penetration.

# Cleantech on the island of Ireland (cont'd)

## Becoming a global cleantech hub

The principle of exporting products, services and solutions is a natural focus for most Irish companies in the cleantech sector, given the relatively small domestic market.

Irish manufacturers, such as Kingspan and Glen Dimplex, are global players in energy efficiency and renewable energy for buildings. Irish project developers, such as Mainstream Renewable Power, NTR, Island Renewable Energy and Gaelectric, are developing renewable energy infrastructure in a range of international markets and across a number of continents, with more than 10,000MW of wind and solar energy capacity under development between them. Irish-headquartered engineering service providers active in the cleantech sector, such as ESB International, Sepam, Mercury and a number of others, are also active across Europe, Middle East and Asia.

The Irish financial services sector, through the International Financial Services Centre (IFSC), which currently employs 33,000 people and services international financial assets worth €1.8t, is currently positioning itself to be a global center of excellence for green finance, i.e., funds focused on the cleantech sector. The Green IFSC already has €2.3b under management, double the 2009 figure, with expectations that this amount will continue to grow exponentially.

## An economic assessment of the domestic cleantech sector

Assessing the total return of cleantech to the Irish economy is a complex task, given the unpredictable nature of forecasting future oil, gas and emissions prices and the broad suite of activities within the cleantech sector.

A recent independent economic assessment of an aggregation of previous studies and literature spanning the cleantech sector, commissioned by Ernst & Young, demonstrate that the cleantech sector can significantly contribute to Ireland's overall competitiveness and investment attractiveness. Addressing Ireland's energy challenges will help develop new areas of expertise (e.g., green finance, energy management) which, in turn, will help Ireland rebalance and transform its economy, filling the gap left by the decline in the consumer, construction and government sectors.

The initial outcome from modeling a number of scenarios for the development of the cleantech sector in the domestic market indicates the following:

- ▶ GDP – cleantech has the potential to boost Irish GDP by between 2% and 4.6% by 2020.
- ▶ Investment – Ireland can exploit its attractive corporate investment climate to secure very substantial investment and create new sources of wealth and jobs.
- ▶ Jobs – the total number of jobs (direct, indirect and induced) created by cleantech by 2020 will range between 26,300 and 79,900 (or 1.4%-4.1% of total baseline employment).
- ▶ Energy cost saving – cleantech products and services will result in improved resource efficiency by reducing business and household costs, thus boosting competitiveness.
- ▶ Balance of payments benefits – investment in cleantech brings the opportunity to export new technology, goods and services; greater indigenous energy production and energy efficiency will significantly reduce the outlay on fossil fuel imports and open up an energy export market.

## What needs to be done to grasp the opportunity?

To unlock the economic potential of cleantech and take advantage of Ireland's exceptional resources in terms of natural and human capital, a series of coordinated strategic interventions are required to create, nurture and support a private sector-led expansion of activity. As shown by countries of a similar size that have developed an early market advantage in the cleantech sector, such as Denmark and South Korea, international competitiveness will not be achieved without focused and integrated government coordination and support at a domestic level.

Infrastructure development is central to the growth of the cleantech sector. Buildings are responsible for circa 40% of all energy consumed in Ireland. An accelerated initiative to retrofit public and private buildings, domestic and non-domestic and possibly funded by private capital, would notably reduce energy consumption and generate significant employment, resulting in lower emissions and higher competitiveness. Accelerated expansion, reinforcement and renewal of the distribution and transmission electricity grids will be required over the next decade to support and exceed renewable energy targets, encourage the electrification of transport, enable an energy export industry and meet growth in demand. This should be a key priority for capital spending.

Policy-makers need to continue to develop and attract green capital through the active promotion of the Green IFSC initiative. Capital programs for domestic cleantech infrastructure will play a role in attracting this private capital to Ireland in order to build up the necessary cluster of people, capital and companies to lead this sector.

The Government needs to support and encourage the development of commercial and research-driven cleantech clusters (such as Dublin's The Green Way) to attract inward investment and to nurture indigenous companies in the sector. Appropriate green procurement plans designed to facilitate and encourage smaller growth companies in the cleantech sector will be a necessary addition to facilitate this growth.

The current 20% renewable electricity penetration is a remarkable achievement for a relatively isolated electricity market by global standards, and continuing this trajectory to reach and exceed 40% by 2020 needs to be encouraged further. Increasing this penetration to enable an energy export industry should be a prime long-term objective, given the potential of the country to produce a surplus of competitively priced onshore and offshore renewable energy, compared with most other countries in Europe.

## Conclusion

The diversified nature of the cleantech sector can span across a range of policy-makers, departments and policies for any government and thus can be difficult to capture and coordinate in one place. The objectives of the cleantech sector are twofold: increasing resource efficiency and reducing environmental degradation. These two objectives need to be central to all policies.

Creating a national long-term integrated policy framework for the cleantech sector, spanning Government departments and even successive Governments, is an inherently difficult but necessary step to unlocking the sector's transformative capacity for any economy. The ability to manage water, waste, energy and emissions efficiently and securely is central to any functioning economy and critical for long-term economic sustainability. Ireland's unique situation offers an opportunity to address these four areas at a domestic level in order to develop solutions from which every country in the world can subsequently benefit.

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# Ocean energy opportunities

## Introduction

With a global potential capacity by 2050 estimated at 748GW by the International Energy Agency (IEA), ocean energy is emerging today as a credible low carbon alternative for energy generation. The offshore renewables sector has seen increasing activity recently with a number of mergers and acquisitions, the launch of research and demonstration projects and the implementation of various joint initiatives, including industrial clusters. Despite this recent activity, most technologies are still in the development stage. Many technological, economic and regulatory barriers need to be overcome to enable large-scale commercial deployment.

## High development potential for emerging technologies

Today, the only mature ocean energy technology (that has reached the stage of full-scale industrial and commercial deployment) is fixed-base wind turbines, using either piles driven into the seabed or a gravity base that sits on the seabed floor. However, this technology is only deployable in areas with the right conditions in terms of ocean depth, wind patterns, impacts on the environment and existing economic activities. Tidal range energy can be categorized as a relatively mature technology; however, market deployment continues to be slow. The development of other ocean energy technologies has accelerated in the past few years, although most are still at the prototype or demonstration stage. Unlike fixed-base wind turbines and tidal range power plants, these other technologies are not constrained by depth limitations or distance from the shore. A brief description of some of these emerging ocean energy technologies is set out below.

### 1. Tidal range energy

Tidal range power plants convert the energy potential of tidal variations into power. Although the technology is now relatively mature, only four tidal power plants are in operation (in Canada, China, France and South Korea). A new 254MW plant was brought into commission in South Korea in early September 2011, and is now the world's largest tidal range power plant. Previously, this record was held by the 240MW Rance Estuary plant in France, built in 1966. Meanwhile, the UK Government decided in October 2010 to put plans for a tidal power plant in the Severn Estuary on hold. In general, a limited number of projects are under way at present due to high capital costs and impact on the environment.

### 2. Floating offshore wind turbines

Floating offshore wind turbines are mounted on a floating structure and can be towed into deep water much further from shore, where winds are stronger and steadier (also minimizing their visual impact from the mainland). For example, unlike the North Sea, with its broad shallow-water plateaux providing ideal conditions for fixed-base wind turbines, the depth of the sea around France drops sharply in most cases as distance from shore increases.

Floating wind turbines could become a future growth driver for the windpower sector, as a complementary solution to fixed-base offshore wind turbines. Several concepts exist for this relatively recent technology, however, none have yet reached the commercial stage. Most designs are currently at the testing and demonstration stage, focusing on technical innovations, such as spar buoys, semi-submersible floating platforms and tension-leg platforms.

Tests on Hywind, the world's first full-scale floating wind turbine developed by Statoil, began off the Norwegian coast in September 2009, while in early December 2011, Windfloat, a semi-submersible wind turbine, was moved into position off the coast of Portugal by EDP Renewables.

### Hywind – the first of its kind

Hywind is the world's first full-scale floating wind turbine, installed in 2009 off Stavanger in Norway. The project is promoted by Statoil, which has invested over €43m; other parties include Technip for the structure, Siemens for the 2.3MW turbine and Nexans for the 15MW cable linking the turbine to the island of Karmøy. The project demonstrates the potential for technology transfers and synergies with other industrial sectors; for example, the turbine rests on a huge ballasted tube, a technology frequently used in the petroleum sector. Since its commissioning in 2010, Hywind has generated 15MWh and the structure's resistance to marine conditions has been assessed. The project will continue through 2012 for further optimization review and to prepare it for future commercial deployment. The first pilot farms are planned off the Scottish coast and should be operational by 2015.

### 3. Tidal energy

Tidal turbines are designed to convert the kinetic energy of ocean and tidal currents into electricity. The resource is highly predictable but also highly localized, the most suitable sites being those where ocean currents are particularly strong. Potential sites have been identified off mainland France (e.g., Raz Blanchard, Passage du Fromveur), Scotland (e.g., Pentland Firth, Orkney Islands) and Ireland (e.g., St. George's Channel, North Channel).

Several prototypes are now being developed in a context of proliferating technological development (some 50 innovative designs have been reported). EDF, for example, is testing a tidal energy farm using OpenHydro technology off Paimpol-Bréhat on the French coast, with a total capacity of 2MW-3MW to be fed into the grid from 2012. The first turbine, assembled at the DCNS shipyard in Brest, was immersed in October 2011.

Another French project to develop a tidal current energy farm comprising seven OpenHydro turbines generating a total of 17MW is awaiting a financing decision after applying for a European NER300 grant. These developments point to an imminent market launch and commercial deployment as early as 2015.

### 4. Wave power

There are several ways of converting wave energy, mainly using either fixed onshore devices or mobile devices at sea. Some onshore projects are operating, such as the Pico Island plant in the Azores and the Islay plant in Scotland, although most technologies are still in the research and development stages. However, wave power holds significant potential, estimated at 29,500TWh/year by Ocean Energy Systems (OES), due to its capacity to operate in both shallow- and deep-water zones. Currently, the diversity of designs (e.g., in-stream or oscillating water column systems, floating platforms, integrated systems) makes it difficult to assess the likely cost or time frame for large-scale commercialization of wave power.

## 5. Ocean thermal energy conversion (OTEC)

OTEC technology relies on a temperature difference of at least 20°C between warm shallow or surface waters and cooler deep waters. This means that the technology can operate only in tropical waters. However, OTEC does also have the advantage of producing renewable energy on a continuous (non-intermittent) basis. Implementing OTEC demands systems engineering competencies and industrial capabilities that limit the number of players involved in its development. Today, DCNS (France) and Lockheed Martin (US) are the leading industrial players. DCNS intends to set up an onshore prototype on La Réunion in early 2012, and is also working in partnership with the regional authority of La Martinique and STX France on an OTEC 10MW pilot, which could be commissioned in 2016.

## 6. Osmotic energy

Osmotic energy technology uses the energy available from the difference in salt concentrations between seawater and freshwater. This resource is therefore found in large river estuaries and fjords. The system uses a semi-permeable membrane that allows the salt concentrations to equalize, thus increasing pressure in the seawater compartment. Statkraft is one of the few industrial players in this sector, having set up the world's first prototype osmotic power plant in Norway. The key bottleneck lies in optimizing membranes, as they generate only a few Watts per square meter. The technology is still in its early research and development stages.

Given the relative immaturity of the various technologies and the untapped potential of the different resources, several of these ocean technologies could contribute significantly to a more diverse global energy mix in the medium to long term. The best prospects for growth in the shorter term (next 10 years) are offshore

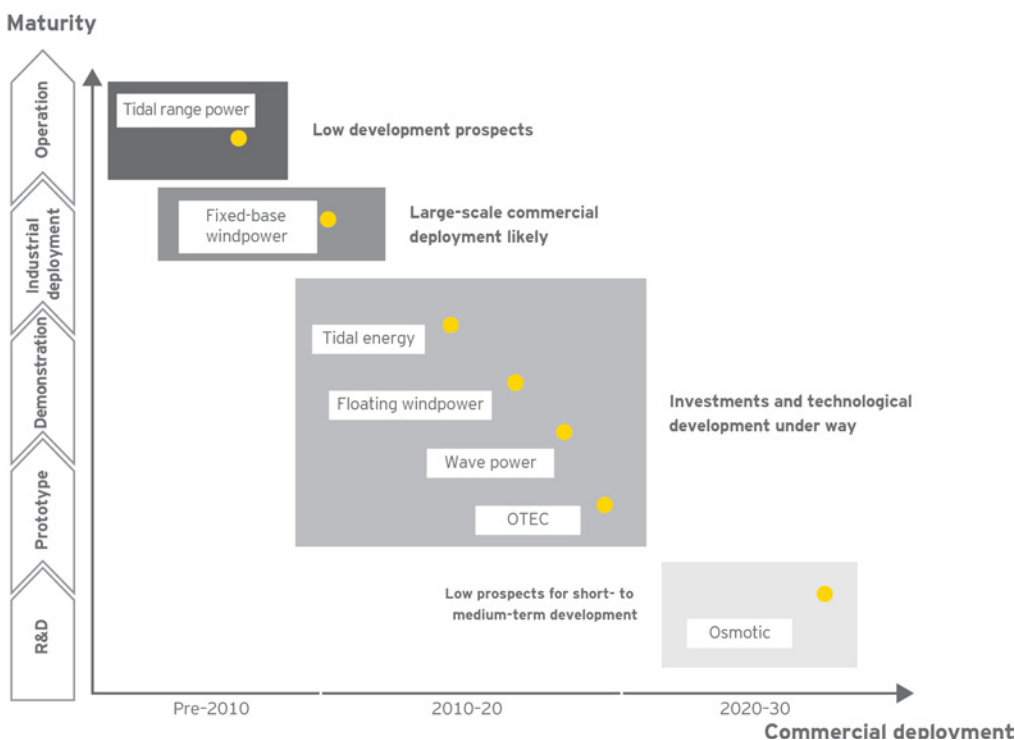
windpower (fixed-base and floating) and tidal energy. Floating wind turbines may even benefit from operational improvements from fixed-base wind turbines. Wave energy and OTEC are unlikely to reach the commercial stage for several years, but are positioned for medium- to long-term market development.

## A global trend involving an increasing number of players

According to the IEA, the total installed capacity of offshore renewables (excluding offshore wind power) reached 519MW in 2011, the majority comprising tidal power plants. Although other existing projects are only at the demonstration stage, the potential for ocean energy development – estimated at 748GW by 2050 – is vast. Europe could play a leading role in shaping the ocean energy landscape; the European Commission's (EC) roadmap targets an installed capacity of 3.6GW by 2020 and 188GW by 2050 (excluding fixed-base and floating wind turbines), representing up to 15% of Europe's energy mix. Large-scale investments in research and development will be needed to generate innovative and competitive technologies in order to achieve these installed capacity and job creation objectives (up to 160,000 direct jobs by 2030).

International initiatives to coordinate and support the sector are emerging but still scattered. The OES initiative, for example, was launched in 2001 under the aegis of the IEA to coordinate players and develop an ocean energy industry. The European Ocean Energy Association represents the sector's interests among European institutions through its membership of over 70 industrialists (including Alstom, DCNS, EDF, GDF Suez, Rexroth, Statkraft) and research organizations. Calls for projects under the various EU or national ocean energy programs are also contributing to structure the sector.

Figure 1: Ocean energy maturity and development prospects



Source: Ernst & Young, based on data from France Energies Marines

# Ocean energy opportunities (cont'd)

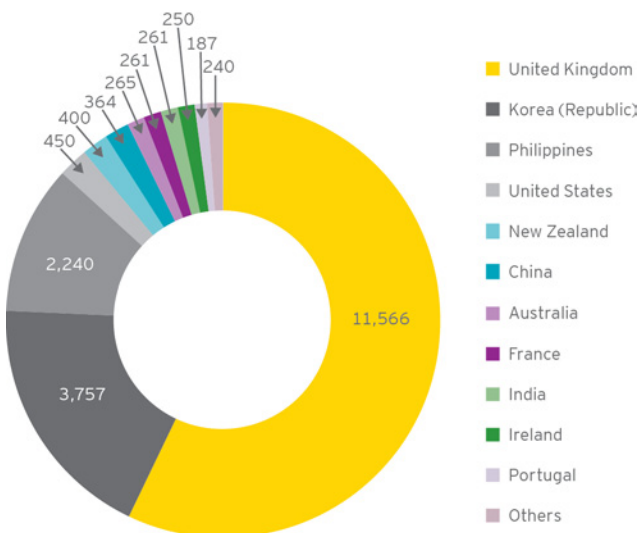
## A global trend involving an increasing number of players (cont'd)

Public and private investments in ocean energy, especially in the US, Canada, Australia and Japan, as well as in several European countries, have risen in recent years. For example, in April 2012, the UK Government launched a call for full-scale wave energy projects, with a £20m (€24m) prize.

## Worldwide investment in the ocean energy sector

Investment in the ocean energy sector is still limited, accounting for less than 2% of all investments in renewable energy. However, investment in this technology sector has increased in recent years, due in particular to certain infrastructure projects. These include South Korea's Shiwa tidal range power plant, which received US\$313m (€235m) from the Korea Water Resources Corporation, and the 200MW tidal project off New Zealand's Kaipara Harbor. Investment in this project, which was announced in 2006 by Crest Energy and authorized in February 2011, totals US\$467m (€350m).

Figure 2: Installed and planned ocean energy capacity by country (MW)



Source: BNEF

Investment activity in the ocean energy sector also involves financing operations (e.g., the US company, Ocean Power Technologies raised over US\$100m (€75m) in 2007) and an increasing number of mergers and acquisitions. This is the case in France, as demonstrated by Alstom's acquisition of shares in AWS Ocean Energy Ltd in May 2011 and an 8% interest in the Irish company OpenHydro in January 2011, increasing to 11% in December the same year.

## Marine energy developments in the UK and Ireland

The UK and Ireland are moving ever closer to harnessing the region's vast ocean energy potential, thanks to improved technical knowledge and a surge in deployment. It is estimated that half of the world's leading companies in wave and tidal power are now based in the UK.

- ▶ Incentives – five Renewable Energy Obligation (RO) certificates per MWh, providing medium-term certainty and enhanced revenue streams for the first commercial projects.
- ▶ The South West Marine Energy Park was launched in 2012.
- ▶ The Crown Estate has leased 33 sites in UK waters – current tidal stream energy leasing round in the Rathlin Island and Torr Head area off Northern Ireland (potential 200MW).
- ▶ European Marine Energy Center (Scotland) planning to boost the number of test sites, citing increased demand. The center already offers 14 full-scale test sites.
- ▶ Ireland's Ocean Energy Development Unit supporting government ambition of 500MW by 2020. New research campus in Cork Harbour could be the largest in the world.

## Conclusion

Although ocean energy technologies remain marginal in terms of current energy generation, they offer high development potential in the longer term. In the medium term, large-scale deployment will depend on the sector's ability to meet a number of technological and economic challenges, and to face competition from other energy sources, including other renewable technologies. With a number of full-scale projects being implemented, the upcoming months will be decisive in demonstrating the reliability of these technologies at scale, as well as their price competitiveness.

A number of developers are investigating options to reduce the cost of equipment, installation, operations and maintenance, in order to lower the levelized cost of electricity generated toward levels comparable with fixed-based offshore wind. This will require substantial public support as well as reinforced cooperation efforts between research organizations and technology developers. Synergies are indeed a real opportunity to maximize the value from developments already in place across the offshore wind sector. For nations with a strong track record in sectors, such as offshore oil and gas, hydropower and shipbuilding, ocean energy also represents a significant opportunity to develop a dynamic industry.

## Contact:

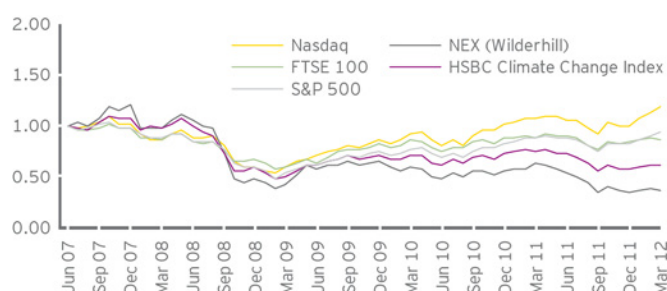
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# Equity trends – renewable energy and indices performance

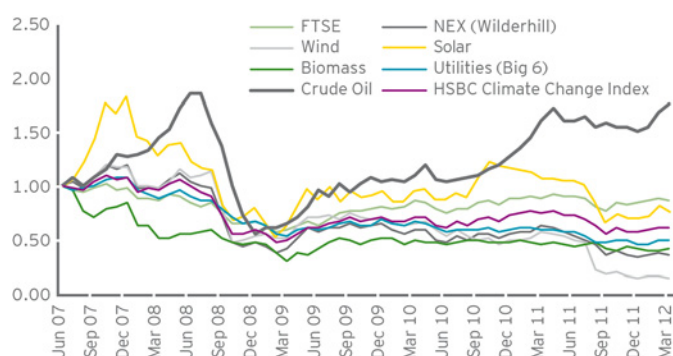
Figure 1: Share price indices



Source: Ernst & Young analysis

October 2011 signaled a change of direction in the equity markets following dire market conditions in the previous six months, and the markets have been slowly recovering since – the US indices have gained more than 20%. The outlook for cleantech and renewables is not as positive, with the NEX and HSBC indices showing a rather flat performance since September. In the past year, these indices have lost 42% and 19% respectively. Various factors are driving this uncertain outlook for renewables: the Eurozone debt crisis, reduced policy support in Europe and the US, and lower carbon and shale gas prices. In addition, European and US manufacturers are being hit by strong competition from Asia.

Figure 2: Market indices

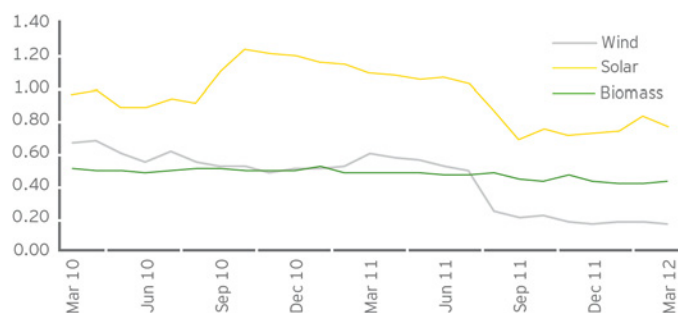


Source: Ernst & Young analysis

The graph above indicates that Brent crude oil prices have been de-coupled from the equity markets over the past year. Although steep rises in oil price in early 2011 leveled off, there are now concerns of another oil spike, with barrel prices approaching the peak reached in mid-2008. In the current harsh environment, it appears that fossil fuels are benefiting while clean power is being undervalued. It is hoped that increasing fossil-fuel prices will ultimately drive the recovery of renewables as the latter becomes increasingly cost-competitive. In the meantime, however, financial incentives for renewables are being reduced or withdrawn altogether due to significantly reduced PV panel and wind turbine prices, together with governments' desire to avoid high consumer energy bills.

The renewables IPO market has been extremely quiet, the biofuels sector being the most active with two NASDAQ flotations; Ceres and Renewable Energy Group for US\$75m (€56m) and US\$69m (€52m). Brightsource abandoned its IPO just hours before it was due to raise c.US\$152m (€114m).

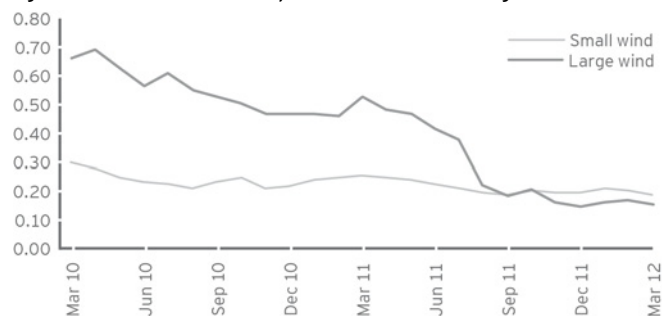
Figure 3: Renewable sector indices



Source: Ernst & Young analysis

The graph above shows relative share prices for an aggregation of companies in the three main renewable energy sectors (base-line is June 2007, pre-credit crunch). After the precipitous declines in August and September 2011, the solar sector has staged a very hesitant and slight recovery. However, victims of the collapse in solar prices over the past 18 months continue to appear; after the much-publicized collapse of Solyndra, Evergreen Solar and Spectrawatt last year, 2012 has seen Q-Cells file for insolvency, joining the ranks of Solon, Solar Millennium and Solarhybrid. First Solar, one of the largest PV manufacturers, recently announced 30% job losses and closure of its German factory. The low market prices are now attracting new players seeking acquisitions, with investors in Asia and the Middle East particularly interested. For example, LDK (China) is buying into Sunways, while Microsol (UAE) is taking over Solon.

Figure 4: Wind sector share prices for small and large firms



Source: Ernst & Young analysis

Meanwhile in the wind sector, the news is not much better. For large-scale manufacturers, it has proved to be an extremely tough few months. For a long while, the larger turbine suppliers had seemed to be more immune than the smaller players in the wind market, but this has changed in the past year. Vestas's market cap is 20% compared with two years ago, with share prices having fallen 75% in the past year. Similarly, Gamesa's and Suzlon's capitalization is about 30% of what it was in early 2010. Inevitably, this has led to restructuring and job losses, and rumors of takeovers by Chinese wind power giants.

So where does the renewable energy sector go from here? The answer must lie in reaching cost-competitiveness as soon as possible, thereby removing reliance on unreliable government subsidies. However, the answer also lies in lowering fossil fuel subsidies and obtaining suitable carbon floor prices. The "set aside" program planned for the EU-ETS will hopefully result in reduced supply of carbon permits and higher prices.

# Transactions and finance

## M&A overview

Renewable M&A activity increased this quarter despite continuing difficult economic conditions and diminishing levels of policy support in Europe and the US. Globally, an estimated US\$21.7b (€16.3b) worth of renewable energy transactions were completed in Q1 2012, representing a 41% increase on the prior quarter.

Market consolidation was a key theme, particularly in solar and wind, and we expect this to continue as participants attempt to control supply chain costs and access new markets. There was also increasing appetite in energy from waste, as evidenced by a number of businesses entering or expanding in the sector. The European market faces significant challenges with frozen and even declining tariffs, overcapacity in the supply chain and difficult project finance conditions.

## Wind

There was a marked slowdown in wind sector transactions this quarter. Policy uncertainties surrounding the US Production Tax Credit (PTC) scheme and economic woes in Europe continued to depress activity in these developed wind markets.

We expect further consolidation in the market, driven by oversupply and price pressure in the sector. We anticipate some technology manufacturers will look to diversify into other renewable technologies as illustrated by the recent entry of Xinjiang Goldwind Science & Technology Co, a leading developer of wind turbines, into the solar market.

In Q1, MidAmerican Energy, a Berkshire Hathaway Inc. backed energy business, agreed to buy an 81MW wind power project from Invenergy Wind LLC. This was the company's second transaction involving renewables in the last six months.

Gamesa, a leading turbine manufacturer and developer, announced the sale of four wind projects with an operating capacity of 480MW to electricity firm Algonquin for close to US\$900m (€675m). The announcement is part of the business's strategy to realize value from its 23.9GW global wind farm portfolio.

Marubeni, a listed Japanese conglomerate, and Innovation Network Corporation of Japan, a state-backed fund, announced a US\$850m (€637m) takeover to acquire Seajacks International, a UK-based offshore wind power service provider. The acquirers intend to leverage their expertise to develop offshore wind farms in Japan and surrounding areas.

## Solar

Solar transactions rebounded this quarter, but were still 26% below average transaction levels for the last 12 months. Volumes increased in India and Japan, demonstrating the continued importance of solar throughout the Asian markets.

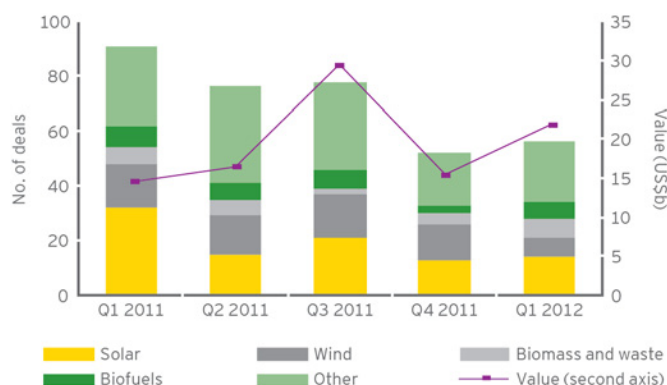
In January, SolarHybrid AG, a large-scale diversified solar business, looked to buy 2.25GW of solar projects from Solar Millennium AG, a bankrupt solar business, for an undisclosed sum. Earlier in the month, the business acquired solar projects from a distressed Israeli construction business.

"The next 12 months are likely to be characterized by further consolidation in the solar and wind supply chains, with a large number of deals expected in Asia."

**Ben Warren**, Energy and Environment Partner,  
Ernst & Young LLP

Eastman Chemical Company, a chemical manufacturer, announced the acquisition of Solutia Inc., a solar materials producer, for US\$4.7b (€3.5b). The pending deal represented a 47% premium on the target's share price and demonstrated market appetite to capture anticipated growth in energy solutions and electronics, particularly in the Asia Pacific region.

**Figure 1: Global energy sector new M&A – value and volume of completed deals**



Source: BNEF

## Biomass and energy from waste

It was an improved quarter for biomass and energy from waste sectors, with transaction volumes up 40% from the 12-month average. M&A activity was driven by the desire to secure clean alternatives to mass-burn incineration and landfill, and showed evidence of vertical integration as companies seek to secure feedstock supply.

ENER-G holdings, a UK renewable energy developer, acquired Biogen Power Ltd. to add energy from waste to its generation portfolio. The transaction gives the business a portfolio of six approved sites, which could generate up to 60MW of power and treat 650,000 tonnes of waste a year.

Utility giant, EDF is paying an undisclosed sum to acquire its first biomass pellet manufacturing plant in Germany. The company plans on using the pellets in its own biomass power operations, in addition to supplying third parties.

## IPO overview

For global IPO markets, it was the poorest quarter on record since Q2 2009. Approximately US\$14.3b (€10.7b) was raised from 157 issues, down by approximately 69% compared with the same period last year. Despite difficult market conditions, some renewable businesses (mainly biofuel companies) did raise capital in public equity markets in Q1. However, the value of these transactions remained relatively low at around US\$58m-US\$75m (€44m-€56m).

As a result of poor renewable sector trading multiples and a deterioration in the performance of publicly traded renewable sector businesses, we expect thin issuance volumes in the coming quarters. Many renewable businesses have indicated intentions of listing but are waiting until conditions and market sentiment improves. IPO readiness and timing are key for businesses looking to list in coming quarters.

## Debt markets and asset finance overview

This quarter saw increased activity in global debt markets. Close to US\$1.7t (€1.3t) was raised in Q1, representing a marginal improvement on the same period in the prior year. The quarter saw a notable recovery in corporate bond issues, reflecting more stability in the markets and corporates moving ahead with some investment programs.

Renewable businesses were relatively active in the debt markets with a number of participants raising greater than US\$250m (€187m) in the bank loan, public bond and private placement markets. We don't expect to see a significant change in activity in the coming quarters as current macro factors and sector policy concerns continue to hamper activity.

New build asset finance fell sharply in the first quarter, and was at the lowest values seen since Q1 2009, when the financial crisis was at its height. Activity continued to be constrained by policy uncertainties and resulted in only US\$24.2b (€18.1b) being raised in Q1 2012, representing a 30% decline on the prior quarter and a 7% decline for the same period last year.

Projects in China continued to raise the greatest amount of new asset finance for new energy projects with US\$8.3b (€6.2b) in Q1. The US and Europe followed with US\$4.9b (€3.7b) and US\$4.3b (€3.2b) of asset finance raised respectively.

## Wind

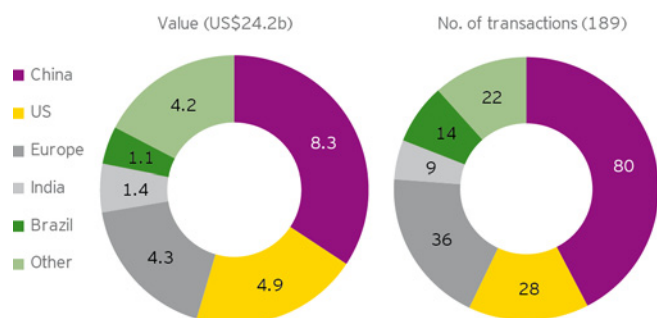
Q1 saw exciting activity in developing wind markets with large project finance deals in Mexico, Latin America and Thailand.

Marena Renovables Capital, backed by Macquarie's Infrastructure Fund, Mitsubishi Corp. and PGGM secured US\$961m (€720m) in senior debt for the development and operation of its 396MW wind farm portfolio. The financing marks the largest commercial debt tranche for a wind plant located in Mexico and supports the construction of the largest single-phase wind plant in Latin America.

Spanish utility, Iberdrola and Neoenergia, a Brazilian power generator secured US\$220m (€165m) of debt from Brazil's national development bank to develop a 138MW portfolio of wind projects in Brazil. In the same quarter, Iberdrola raised €1.0b of A-rated bonds in the Eurobond market.

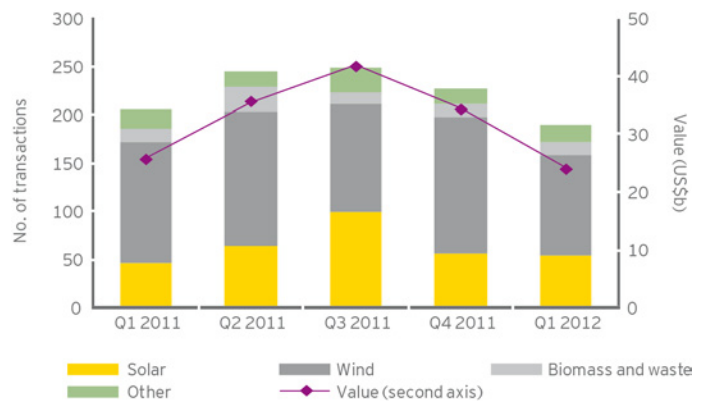
In January, Wind Energy Holding secured finance for the development of the 207MW Pho Cai Wind Farm. The project will be the first large-scale wind project in Thailand and the largest wind farm in southeast Asia. The financing secured at this stage was close to THB7b (€200m).

Figure 2: Q1 2012 New build asset finance by region



Source: BNEF

Figure 3: Global new build asset finance raised (value and volume)



Source: BNEF

## Biomass & energy from waste

The biomass and energy from waste sector received funding from private equity and alternative asset managers.

In January, Enova Energy and NuPower received US\$125m (€94m) in mezzanine finance for the development of the Plainfield biomass plant in the UK. The debt was provided by The Carlyle Group, an asset manager, and will be used to generate 37.5MW of clean energy.

In February, Waste Management Inc, a US waste management business, and Viking Consortium Holdings secured £153m (€183m) in debt for the development of the 20MW Cory & Wheelabrator Norfolk Waste-to-Energy Plant. The facility was also awarded a £91m (€109m) waste infrastructure grant from the Government.

## Solar

The solar sector witnessed a number of significant fund raises in the US, South Africa and Bulgaria.

Topaz Solar farm, a 550MW solar PV power plant being constructed in California, accessed US\$700m (€525m) in funding via a private placement of senior secured notes. The project is backed by MidAmerican Energy and will be one of the world's largest solar installations.

Soitec Solar, a semiconductor manufacturer, secured funding for the 50MW Touwsrivier solar CSP plant in South Africa. The project will be the first large-scale CPV renewable energy plant in South Africa. The value of the financing was estimated at US\$329m (€247m).

At the end of the quarter, SunEdison LLC secured €155m in non-recourse debt financing for the development of the 60.4MW Karadzhhalovo PV Plant in Bulgaria. Construction of the plant began in September 2011 with the facility interconnected in March 2012.

"Access to capital will remain the single biggest differentiator for companies in both the technology and infrastructure markets."

**Ben Warren**, Energy and Environment Partner,  
Ernst & Young LLP

# All renewables index at May 2012

The pace of growth in the solar sector this past year has been faster than anticipated. We have therefore revised the weighting applied to each technology in calculating the ARI, in order to reflect the increasing prominence of solar in the global energy mix. We have also adjusted the proportion of offshore wind and CSP in the respective indices. The previous ranking in the table reflects the weighting-adjusted issue 32 rankings (see Appendix on page 34), therefore the movements below reflect only the impact of the quarter's news (including latest sovereign credit rating and credit default swaps) and recently released annual wind statistics (actual and forecast).

For the first time, we have presented the ARI to one decimal place, in order to provide increased granularity over the rankings. The expansion of the index to 40 countries in recent years, as well as the increasingly noticeable contraction of the index that has reduced the gap between the traditionally "developed" markets at the top of the index and the "emerging" markets lower down the table, has resulted in an increasing number of "joint" positions in recent issues. The presentation of the ARI scores to one decimal place aims to minimize this outcome and allow greater visibility on the relative attractiveness of each country as determined by its ranking.

Rank <sup>1</sup>		Country	All renewables	Wind index	Onshore wind	Offshore wind	Solar index	Solar PV	Solar CSP	Biomass/ other	Geo-thermal	Infra-structure <sup>2</sup>
1	(1)	China	70.4	77	78	70	64	66	47	60	51	75
2	(2)	US <sup>3</sup>	67.5	65	68	56	73	73	74	62	68	62
3	(3)	Germany	65.1	68	65	79	60	69	0	68	57	71
4	(4)	India	65.0	65	71	42	67	69	55	62	45	67
5	(5)	Italy	57.5	58	60	49	59	61	41	52	61	55
6	(6)	UK	55.8	64	61	80	42	47	0	58	36	67
7	(7)	France	55.7	58	59	54	53	56	29	57	34	56
8	(8)	Canada	53.4	63	66	46	40	45	0	50	36	66
9	(9)	Brazil	50.4	53	55	40	47	49	33	54	24	51
10	(13)	Japan	50.3	48	49	41	58	62	27	40	47	54
11	(10)	Australia	49.5	49	51	38	53	53	54	43	57	47
12	(12)	Sweden	49.2	55	55	53	37	42	0	58	35	56
13	(11)	Spain	48.4	47	50	36	54	53	58	44	27	38
14	(14)	Romania	47.7	53	56	39	40	45	0	45	41	46
15	(16)	Poland	46.7	54	56	42	37	42	0	44	23	48
16	(15)	South Korea	46.6	47	46	53	48	51	29	41	36	45
17	(18)	South Africa	45.3	49	52	36	42	41	50	36	34	49
18	(17)	Greece	44.6	45	48	33	48	50	33	34	25	32
19	(19)	Portugal	44.3	45	48	35	46	47	35	38	25	38
20	(20)	Belgium	44.2	51	49	57	36	42	0	39	27	50
21	(21)	Mexico	43.9	45	46	40	43	44	40	39	55	41
22	(22)	Netherlands	42.5	48	49	47	36	41	0	37	21	41
23	(23)	Denmark	42.2	46	44	58	35	40	0	46	33	52
24	(24)	Ireland	42.1	52	52	50	26	30	0	43	23	48
25	(26)	Morocco	41.3	39	42	26	48	47	54	38	21	42
26	(31)	Austria <sup>4</sup>	40.5	36	40	0	44	51	0	51	34	51
26	(25)	Taiwan	40.5	43	44	38	38	43	0	37	38	43
28	(27)	Norway	40.2	48	49	45	26	30	0	45	31	51
29	(30)	Turkey	40.0	42	44	32	39	40	28	35	41	37
30	(28)	Ukraine	39.8	39	41	27	40	46	0	46	32	41
31	(29)	Egypt	39.7	42	44	31	39	39	44	34	24	32
32	(32)	Finland	39.6	46	48	39	25	28	0	53	26	47
33	(33)	New Zealand	39.5	47	50	37	27	31	0	34	51	47
34	(34)	Tunisia	36.8	36	38	27	44	44	48	20	27	41
35	(35)	Bulgaria	36.4	36	39	24	37	42	0	35	34	39
36	(36)	Israel	36.3	33	37	14	46	47	39	26	28	38
37	(37)	Argentina	34.9	37	40	22	33	36	17	32	27	34
38	(39)	Chile	34.4	36	39	24	34	35	24	29	38	42
39	(38)	Hungary <sup>4</sup>	34.0	34	37	0	31	35	0	43	39	36
40	(40)	Czech <sup>4</sup>	32.8	34	38	0	32	36	0	32	23	46

Source: Ernst & Young analysis

## Notes:

- Adjusted ranking in Issue 32 (see appendix) is shown in brackets.
- Combines with each set of technology factors to produce the individual technology indices.
- This indicates US states with renewable portfolio standard (RPS) and favorable renewable energy regimes.
- Technology weightings have been adjusted for landlocked countries to reflect the lack of offshore potential

China retains the top ranking but falls a point in the ARI. This reflects concerns that growth in the country's wind sector is stalling in the short to medium term, while the grid infrastructure catches up with the impressive growth of installations in recent years. The solar sector is expected to see a boost in installations as the focus becomes more domestic, absorbing excess panels that have built up in the supply chain. However, the scope for increased foreign investment in the sector is likely to be limited in the short term.

The US is continuing to suffer from the effects of political wrangling, the electoral cycle and ongoing uncertainty around the country's long-term energy strategy. The expiry of key funding programs at the end of 2011 and the pending expiry at the end of 2012 of the popular PTC for wind projects, have left the country's renewable energy sector in limbo. Uncertainty around the extension of these incentive schemes is creating a boom-bust scenario as developers rush to meet ever-moving deadlines. The lack of consistency and commitment is creating a turbulent growth platform for US renewable energy, resulting in a two-point drop in the ARI.

Germany follows China and the US in falling in the ARI. It drops a point but retains its third-place ranking. The continuing high rate of new solar installations has caused the Government to bring forward further FIT cuts and introduce more frequent reductions. The country's offshore wind sector is also facing significant challenges in getting offshore installations connected to the grid.

India's wind sector is likely to take a knock in the short to medium term following the expiry of a key tax break for wind projects, resulting in a one point fall in the ARI. Meanwhile, Q1 saw mixed messages for the solar sector, keeping the solar index neutral overall.

Italy, mirroring the trend across the top five ranking countries, has also fallen a point in the ARI following the release of two decrees that would slash solar subsidies by 35% and most other renewable technologies by 15%.

The UK and France remain in sixth position with no overall change to the ARI score. The UK's solar sector received a blow following the Department of Energy and Climate Change's (DECC) proposals for another round of FIT cuts in the coming months; However, the renewable energy sector as a whole, and offshore in particular, received a boost from plans to implement significant spending programs to improve the country's transmission infrastructure for renewable energy source (RES) projects. The UK's marine energy sector also continued to see a flurry of activity in Q1.

In France, April saw the award of round one contracts as part of the country's first offshore wind tender, with state-owned utility EDF in partnership with Alstom winning three of the tenders for offshore wind sites. The fourth was won by a consortium led by Spain's Iberdrola. The companies will build c.2GW of offshore wind capacity at an estimated cost of €7b. While this has not been specifically scored for this issue (as the tender has already been reflected in the scoring previously), it signifies a positive step forward for France's offshore wind sector.

Canada has dropped a point in the ARI following Ontario's announcement that it will reduce premium rates for wind and solar power in a two-year review of a program covering 4.6GW.

Japan has jumped to ninth place in the ranking following the announcement in April of government panel recommendations on the 20-year preferential prices for solar, wind, geothermal,

biomass and hydropower, ready for 1 July 2012 implementation. The rates are tipped to rank among the world's most attractive support mechanisms for renewables, with the tariffs likely to help investors generate highly attractive returns. Also in Q1, the Government granted access to national parks for geothermal developers to conduct surveys and build geothermal plants. The parks contain an estimated 80% of Japan's estimated 23GW of geothermal resources.

While Brazil's wind sector is battling project delays, its solar sector is experiencing strong growth thanks to new regulations, favorable funding programs and a growing project pipeline. The net impact across these two key sectors has resulted in an unchanged ARI position this issue.

Spain has fallen three places in the rankings to joint 13th place as a result of an increasingly stagnant wind market and mixed signals in the solar sector. The ongoing suspension of premium power rates for solar PV, and proposals to slash subsidies for CSP power plants, may be offset by promising signs that subsidy-free solar projects are now on the horizon.

Poland has increased a place in the ARI following a U-turn by the Government, as a result of strong industry objections to a bill released in December last year which would have removed the guaranteed purchase price for green power and cut support for onshore wind power by 25%. The pledge to reverse its course suggests the Government agrees that the market is not yet ready to move away from a guaranteed purchase price.

Mexico has climbed two places in the ARI following the passing of a climate change law in April, which includes, alongside emissions targets, the stipulation that 24% of the country's electricity should come from RES by 2024, sending out a strong policy signal to Mexico's RES sector. Q1 also saw Mexico's wind capacity pass the 1GW mark, with a further US\$20b (€15b) of investment expected in the sector over the next 10 years.

The Netherlands has dropped a point in the ARI following the launch of its new subsidy scheme in March, which forces different renewable energy technologies to compete for a limited budget. There is concern that the scheme will result in an overemphasis on cheaper technologies at the expense of less mature technologies, resulting in under diversification of the country's energy mix.

Austria has received a boost following EC approval of its 2012 Green Electricity Act, which will support the release of additional funding and contains government assurances that FITs will remain unaffected.

Taiwan has fallen a point in the ARI following an announcement in Q1 that it has increased preferential power prices for biomass projects but cut the rates paid for wind and solar installations.

Chile has jumped a point in the ARI following a very strong Q1. The Government is currently evaluating a bill that would require Chile to get 20% of electricity from RES by 2020, up from the current mandate of 5%. The bill has the potential to trigger the development of as much as 4GW of RES capacity by 2020, and US\$10b (€7b) of investment. The quarter also saw significant activity across both the solar and geothermal markets in particular.

# Wind indices at May 2012

Rank <sup>1</sup>		Country	Wind Index	Onshore wind	Offshore wind
1	(1)	China	77	78	70
2	(2)	Germany	68	65	79
3	(3)	US <sup>2</sup>	65	68	56
3	(4)	India	65	71	42
5	(5)	UK	64	61	80
6	(6)	Canada	63	66	46
7	(8)	France	58	59	54
7	(7)	Italy	58	60	49
9	(9)	Sweden	55	55	53
10	(10)	Poland	54	56	42
11	(10)	Romania	53	56	39
11	(10)	Brazil	53	55	40
13	(13)	Ireland	52	52	50
14	(14)	Belgium	51	49	57
15	(15)	South Africa	49	52	36
15	(15)	Australia	49	51	38
17	(15)	Netherlands	48	49	47
17	(22)	Japan	48	49	41
17	(18)	Norway	48	49	45
20	(20)	South Korea	47	46	53
20	(20)	New Zealand	47	50	37
20	(18)	Spain	47	50	36
23	(22)	Denmark	46	44	58
23	(22)	Finland	46	48	39
25	(22)	Portugal	45	48	35
25	(26)	Greece	45	48	33
25	(27)	Mexico	45	46	40
28	(27)	Taiwan	43	44	38
29	(30)	Turkey	42	44	32
29	(29)	Egypt	42	44	31
31	(31)	Morocco	39	42	26
31	(31)	Ukraine	39	41	27
33	(33)	Argentina	37	40	22
34	(34)	Tunisia	36	38	27
34	(34)	Bulgaria	36	39	24
34	(36)	Austria	36	40	0
34	(36)	Chile	36	39	24
38	(38)	Czech	34	38	0
38	(38)	Hungary	34	37	0
40	(40)	Israel	33	37	14

Source: Ernst & Young analysis

Notes:

- Adjusted ranking in Issue 32 (see appendix) is shown in brackets.
- This indicates US states with RPS and favorable renewable energy regimes.

China has fallen a point in the onshore wind index to reflect the fact that more than a quarter of electricity being generated by existing wind farm installations is not actually connected to the grid. This wasted electricity is forcing China to shift its focus toward improving grid infrastructure and imposing tighter regulations on wind project approvals. However, it may take until 2015-16 to close the gap between grid-connected capacity and installations, reducing China's wind sector growth prospects in the short to medium term.

In the US, the scheduled expiry of the PTC at the end of 2012 is causing a rush of activity by developers seeking to beat the deadline. However, uncertainty over the likelihood of an extension being secured before the start of the November elections, if at all, is already causing some to abandon projects scheduled for 2013 and beyond, resulting in a three-point fall in the wind index.

Germany has also fallen in the wind index by one point, primarily as a result of mounting concerns about its ability to connect the country's significant offshore wind project pipeline to the grid. While the Government is now seriously considering ways to support grid development, and some measures are being introduced, this remains at the discussion stage and there is already c.1GW of projects facing delays due to grid bottlenecks.

In India, the expiry of the accelerated depreciation (AD) tax break incentive at the end of March has sparked concerns that the wind sector could experience a temporary slow down while it adjusts to become a more generation-driven market. The AD scheme is credited with having triggered the majority of growth in India's wind sector in recent years; short-term uncertainty therefore results in a wind index score decrease.

Canada has dropped a point in the onshore wind index following the announcement by the Ontario Government that it will reduce premium rates for wind power by 15%.

Brazil has also dropped in the onshore wind index following indications in Q1 that almost 1GW of wind projects secured in last year's auction are delayed with no certain start date. Further, unsustainably low wind power prices as a result of these highly competitive auctions may dampen the rapid growth rate seen to date, and a number of auctions have already been delayed this year.

Meanwhile, Japan leaps up in the wind index following the April release of government panel recommendations on the FIT that should be implemented from July 2012. Wind power was recommended at JPY23.10 (€0.21)/kWh for plants with capacity greater than 20kW and JPY57.75 (€0.53)/kWh for smaller plants.

Spain's wind energy sector recorded its lowest-ever annual growth in 2011 according to the Spanish Wind Business Association.

A total of 1,903MW is currently registered but is still waiting to begin operations, and around half of pipeline capacity will have problems in being built. The current stagnation in the market, as a result of heavily reduced subsidies in recent years, signals poor growth prospects in the short to medium term.

Poland's offshore wind potential received a boost in Q1, attracting 47 applications from investors seeking to develop wind power projects off its Baltic coast. At the end of March, Poland awarded the first license to develop an offshore wind farm. This has increased Poland a point in the offshore wind index.

# Solar indices at May 2012

Rank <sup>1</sup>		Country	Solar index	Solar PV	Solar CSP
1	(1)	US <sup>2</sup>	73	73	74
2	(2)	India	67	69	55
3	(3)	China	64	66	47
4	(4)	Germany	60	69	0
5	(5)	Italy	59	61	41
6	(6)	Japan	58	62	27
7	(7)	Spain	54	53	58
8	(8)	Australia	53	53	54
8	(9)	France	53	56	29
10	(10)	Greece	48	50	33
10	(11)	South Korea	48	51	29
10	(11)	Morocco	48	47	54
13	(14)	Brazil	47	49	33
14	(13)	Portugal	46	47	35
14	(14)	Israel	46	47	39
16	(16)	Austria	44	51	0
16	(16)	Tunisia	44	44	48
18	(18)	Mexico	43	44	40
19	(19)	South Africa	42	41	50
19	(19)	UK	42	47	0
21	(21)	Ukraine	40	46	0
21	(21)	Canada	40	45	0
21	(21)	Romania	40	45	0
24	(24)	Egypt	39	39	44
24	(26)	Turkey	39	40	28
26	(24)	Taiwan	38	43	0
27	(27)	Sweden	37	42	0
27	(27)	Bulgaria	37	42	0
27	(30)	Poland	37	42	0
30	(30)	Belgium	36	42	0
30	(27)	Netherlands	36	41	0
32	(32)	Denmark	35	40	0
33	(34)	Chile	34	35	24
34	(33)	Argentina	33	36	17
35	(35)	Czech	32	36	0
36	(35)	Hungary	31	35	0
37	(37)	New Zealand	27	31	0
38	(38)	Ireland	26	30	0
38	(38)	Norway	26	30	0
40	(41)	Finland	25	28	0

Source: Ernst & Young analysis

## Notes:

- Adjusted ranking in Issue 32 (see appendix) is shown in brackets.
- This indicates US states with RPS and favorable renewable energy regimes.

India has remained neutral in this issue's solar index – while PV tariffs were cut in January, this was counter-balanced by the announcement that import duties on CSP equipment are to be scrapped. Further, it is anticipated that India's solar market will be an attractive alternative for investors shifting their focus away from Europe's flailing solar sector.

China has dropped a point in the solar PV index amid concerns that the anticipated boost in domestic installations over the coming years will actually generate very little in the way of new dollar investment for the country. The sector is likely to use its excess supply of solar panels to facilitate this installation growth, bringing few new opportunities for investors.

Germany is seeking to implement more regular and predictable cuts in its solar PV tariffs, in order to control the rate of growth and reduce the country's subsidy budget. The proposed rate cuts are to be implemented in April, four months earlier than planned. Critics claim the cuts are premature.

Italy falls a point in the solar index following the release of a draft bill which calls for a 35% cut in the subsidies awarded to solar energy projects. The bill also reduces the total annual spending limit on solar subsidies and seeks to prioritize small installations while limiting large-scale projects.

Japan increases a point in the solar index following the release of government recommendations on solar FITs that will be applicable from July 2012. Solar power providers could earn JPY42 (€0.38)/kWh, approximately three times the amount charged to industrial and commercial users.

Spain has dropped a point in the CSP index following a proposal that would reduce incentive rates by as much as 75% through to 2017 in exchange for equivalent higher tariffs thereafter. However, the PV index has remained stable this quarter, with ongoing anxiety following the suspension of the PV tariff earlier in the year being tempered by an announcement that two German solar developers are planning to build giant PV plants (278MW and 250MW) in Spain. These are expected to earn a return without government subsidies, opening the way for subsidy-free solar in Spain and boosting confidence in the flagging Spanish market.

Greece cut its solar subsidies in February due to budgetary constraints and the fact that it has already met its 2014 target of 1.5GW. Projects generating more than 100kW will see their subsidies cut by 12.5% to €0.292/kWh. The rate will then drop every six months to hit €0.203/kWh by August 2014.

Brazil's solar sector received a boost in Q1, which has increased its position in the solar index. Under new regulations due to be implemented later this year, utilities will be eligible for an 80% discount on taxes paid for distributing solar-generated electricity, and a net-metering regulation will permit homeowners and businesses to feed rooftop solar-generated electricity into the power grid. It was also announced that solar projects will be offered loans c.5% lower than standard rates.

Israel climbs a point in the solar index following strong signs of market activity in Q1. Several PV plants totaling 30MW-40MW received conditional licenses, dwarfing the country's current largest PV plant at just 5MW. Two CSP plants with combined capacity of 180MW were also awarded licenses in Q1.

The UK, like Germany and Italy, is attempting to stabilize its subsidy spending. A consultation launched in Q1 outlined the Government's plans to cut subsidies in March, July and October, and schedule bi-annual cuts thereafter (see article for detail). The rapid succession of cuts has caused confidence in the longevity of the Government's incentive schemes to plummet and weakened the attractiveness of solar projects in the UK.

Canada has dropped a point in the solar PV index following the announcement by the Ontario Government that it will reduce premium rates for solar power by 20%.

Chile jumps up in the solar index this quarter following several announcements of large-scale projects across both the PV and CSP sectors.



## Wind and solar sectors dealing with overcapacity

Ranking	Issue 33	Issue 32
All renewables index	1	1
Wind index	1	1
Solar Index	3	3

Source: Ernst & Young analysis

### Policy

The start of 2012 saw China lower its national GDP growth target from 8% (in place since 2005) to 7.5%. The reduction is a signal of the Government's commitment to shift to a more sustainable and efficient economic model, with more focus on increasing domestic consumption. This has undoubtedly been driven partly by expectations that reduced exports (due to the European crisis and a fragile US recovery) could dampen growth in China.

It is hoped the country's renewed focus on making economic development more sustainable and efficient will boost growth across China's clean energy sector. It is likely the Government will have to ease lending and possibly inject new capital stimulus in 2012 to counter declining growth – an easier financing environment should help execute pipeline projects in 2012 and beyond. Further, despite a potential downturn, the Government has committed to spending CNY700b (€83b) over the next decade on clean energy, in a bid to drive down the cost of renewable energy through economies of scale.

Q1 news also indicated that China is considering imposing a direct tax on its largest greenhouse gas emitters by 2015. Proposals for an environmental tax are being reviewed by the Ministry of Finance and could be in place before the end of the 2011-15 Five-Year Plan. The CNY10 (€1.20)/tCO<sub>2</sub> tax on the largest consumers of fossil fuels is likely to provide an indirect boost for renewables.

However, despite the strong growth signals from these new macroeconomic and environmental policies, the short-term outlook for China's renewable energy market is less optimistic. It seems that China is now having to deal with the outcome of several years of rapid and unchecked growth in the wind and solar sectors in particular – the market reality has finally caught up with them.

### Wind

Despite adding a staggering 17.4GW of wind capacity last year, taking cumulative capacity to 62GW, this represented a growth rate of only c.35% compared with c.70% in 2010. This slow down in installations is partly a result of government changes in 2011 to enable a more controlled execution of the project pipeline with stricter government rules on project approvals.

Short-term growth in the sector is also being slowed by inadequate grid connections. It is estimated that up to 25% of electricity generated from wind turbines is wasted. Wind power generators failed to meet last year's target due to infrastructure issues; specifically, that the grid is undeveloped in areas with high resources and there is insufficient capacity on the grid to move power from the wind bases over long distances to load centers.

In Q1, the National Energy Administration and Finance Ministry announced that the Government intends to provide subsidies to the state-owned grid companies to improve transmission links with

wind generators. This follows State Grid's announcement in late 2011 that it will invest US\$250b (€187b) to upgrade the country's grid infrastructure over the next five years.

However, the sector is likely to continue suffering from infrastructure barriers in the near term. Although there are positive signs China is attempting to shift its focus toward grid connection and away from scaling up installations, MAKE Consulting (MAKE) projects that it will take until 2016 to close the gap between grid-connected capacity and installations. In the meantime, severe overcapacity of turbines and price competition at home and abroad, are likely to put pressure on margins for both turbine manufacturers and project developers.

### Solar

March saw the US Department of Commerce impose preliminary countervailing duties on Chinese-manufactured crystalline silicon cells and modules. The duties are to be applied retroactively from December last year and range between 2.9% to 4.7%. The decision was widely anticipated, but the duties were lower than expected. BNEF believes the tariff won't have a significant impact on Chinese-sourced modules, noting they are at least 10% cheaper than similar products made elsewhere.

However, Trina Solar Ltd., China's third-largest maker of solar panels has said that it may locate manufacturing facilities in the US to increase US sales and minimize the impact of the tariffs. Perhaps more serious is the decision to be made by the US DoE on 16 May on whether to impose anti-dumping duties, which are typically higher than countervailing duties.

Notwithstanding US retaliation against what it alleges are illegal subsidies, Hong Kong-based project developer, China Merchants New Energy Group secured as much as US\$1.6b (€1.2b) of financing from the China Development Bank to build and operate solar plants at home and abroad.

The timing of such funding is appropriate. It is expected that China will experience a boost in solar energy installations through 2012 as part of the country's new focus on domestic consumption, and in a bid to absorb the oversupply of panels resulting from decreased demand across Europe and increased solar manufacturing in the US.

However, domestic installations may not soak up as much of China's oversupply as expected, with only relatively modest installation goals in its 12th five-year plan of 3GW per year up to 2015, compared with China's estimated 18GW-19GW module production in 2011. Further, utilizing the existing oversupply of panels and cells to aid the expansion of the country's domestic solar capacity means there is actually no new dollar investment associated with this growth. Therefore, China's solar investment potential will arguably be stalled in the short to medium term.

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## Inconsistent policies creating inconsistent growth

Ranking	Issue 33	Issue 32
All renewables index	2	2
Wind index	3	3
Solar Index	1	1

Source: Ernst & Young analysis

### Policy

Global clean energy investment data released in Q1 showed that, last year, US clean energy investment moved ahead of China for the first time since 2008, with total investment surging to US\$55.9b (€41.9b), up 33%, compared with an investment rise of just 1% in China to US\$47.4b (€35.5b).

In February, President Obama's budget proposal for 2013 reinforced support for a significant increase in clean energy and also revived plans to cut around US\$39b (€29b) in oil and gas subsidies, and implement a Clean Energy Standard which would mandate 80% of energy from clean sources by 2035.

However, such positive news arguably exacerbates the boom-bust scenario being experienced across the US renewable energy sector, mainly driven by the expiry of the 1603 Treasury Grant and loan guarantee programs at the end of 2011, uncertainty over tax credit renewals and a continued lack of commitment to long-term energy policy. The current highly charged political environment pending November elections makes it less likely that policy will change significantly within the next 12 months.

Renewables trade associations continued their fight to revive the 1603 Treasury Grant through the first quarter of 2012, but appear to be making little headway in the face of the impending reform dialogue. The 1603 Grant provided US\$9b (€7b) of funding to support almost 14GW of clean energy capacity and has been a key driver of strong renewables growth in the US over the past two years. 2011 also saw a freeze in the issue of loan guarantees by the DoE. However, in April, the DoE announced it will begin issuing conditional loan guarantees for clean energy projects "over the next several months," despite some criticism following the bankruptcy of Solyndra in 2011 after having received a US\$535m (€401m) loan guarantee.

In parallel, wind advocates are frantically making the case for the extension of the Sec. 45 PTC, the expiration of which is set for 31 December 2012. The expiration of the PTC would likely significantly deflate wind development beyond 2012. Congress opted not to extend the credit as part of a broader tax bill earlier this year, which many believed was the only viable means of securing the extension before the November elections. Currently, a bipartisan effort led by Senator Grassley, the American Energy and Job Promotion Act, appears to be the strongest prospect for an extension, though opinion on the likelihood of success remains divided.

Supporters of the Sec 48 Investment Tax Credit (ITC), although not as pressed for time, also have their eye on the expiration of the tax credit supportive of solar (end of 2016), geothermal and biomass development (end of 2013).

Notwithstanding the current turmoil of the country's clean energy sector, the US Defense Department reaffirmed in April its commitment to source 25% of its power (3GW) from renewable sources by 2025. In particular, the Air Force is seeking to develop 1GW of RES capacity by 2016, four years earlier than the Navy and Army are planning to achieve this figure.

### Wind

The US installed almost 7GW of new wind energy capacity in 2011, taking cumulative installations to around 47GW, a 19% increase on 2010. Almost half of this figure came through in the fourth quarter, with developers rushing to qualify for cash grants before they expired at the end of the year.

While analysts forecast another strong year based on an estimated 8GW-10GW of new installations, the expiry for the PTC at the end of 2012 casts significant doubts on the fate of the 2013 build cycle, as investors and developers consider abandoning plans given policy uncertainty. Visibility for development beyond 2012 is extremely limited, and MAKE has already downgraded its 2012-2016 capacity forecast.

Even if the PTC is extended, there is a fear that this will be a last minute announcement and may come too late to reverse the damage to 2013 activity. Previous lapses in the incentive in 2000, 2002 and 2004 resulted in construction of new wind projects plummeting by at least 70% in successive years. The cycle of regulatory uncertainty is putting strain on the entire wind industry value chain, especially the manufacturing sector.

### Offshore wind

The future looks slightly brighter for the offshore wind market, however. The DoE will make US\$180m (€135m) available over the next six years to support up to four wind farms off the coast of the country or in the Great Lakes. The streamlining of wind power development on the Great Lakes will likely receive a further boost through the recent formation of a consortium comprising 5 states and 10 federal agencies.

Meanwhile, Cape Wind, the proposed 468 MW offshore wind farm to be installed in Nantucket Sound, inched yet another step closer to commencing construction with the closing of a power purchase agreement (PPA). This is likely to reduce the challenge of securing construction finance.

### Solar

In March, the US Commerce Department imposed duties of as much as 4.73% on Chinese solar panels in response to complaints from US solar manufacturers that Chinese rivals were receiving improper government subsidies. Domestic manufacturers may now benefit from more competitive prices, although market analysts suggest the less than 5% tariff is insufficient to curb these Chinese imports.

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## Solar FITs slashed again while grid challenges offshore

Ranking	Issue 33	Issue 32
All renewables index	3	3
Wind index	2	2
Solar Index	4	4

Source: Ernst & Young analysis

### General

At the end of Q1, electricity generated by wind and solar energy passed the important 50% milestone, confirming that the majority of Germany's total electricity production is now sourced from renewables. However, there are still concerns that, based on the current pace of energy savings, Germany may still not achieve its 2020 goal to reduce emissions by 40% compared with 1990 levels.

### Wind

Germany installed an additional 2GW in 2011, representing 36% year-on-year growth and bringing cumulative capacity to more than 29GW. With the FIT level maintained for onshore wind, market analysts project a continued high level of onshore installation activity in the medium term, forecasting an additional 7GW-9GW will be installed in 2012-16. However, given fairly saturated onshore sites, repowering of existing sites is likely to offer strong potential for the German wind market.

Offshore wind continues to offer huge potential and is a key pillar of Germany's long-term energy mix targets. The Government aims to install 10GW this decade and a further 15GW by 2030. Market analysts forecast an additional 4GW-7GW in 2012-16.

With the coming into force of the Marine Facilities Ordinance on 30 January, the permitting procedures for offshore wind turbines should now be more focused and simplified. The federal shipping and hydrography office, BSH aims to award planning permission first to those projects that are likely to deliver electricity to the networks earliest.

Q1 also saw German authorities award RWE Innogy approval to begin building the first 330MW of the Nordsee wind farm, which is expected have a total installed capacity of 1GW at a cost of €3b once complete.

The Government's offshore wind targets are currently being undermined, however, by the significant challenges facing Germany's offshore market in getting turbines connected to the grid. The country's major utilities, including E.ON and RWE, have threatened to halt investment in wind projects unless permitting and connection obstacles are removed. At the beginning of 2012, up to 1GW of German offshore projects were facing one- to two-year delays due to current transmission bottlenecks.

In response to complaints from major players in the industry, the Government has set up a working group to look at ways to accelerate offshore grid connections, acknowledging that mid-sized grid operators do not have the scale to finance multi-billion dollar projects alone. In late April, the Government announced that it is considering an expansion of the €5b program set up by state-owned KfW last year to boost investment and support in the country's offshore wind sector. However, it is not

yet clear whether this would involve increasing the size of the fund or opening it up to cover grid projects. In January, a proposal to speed up grid development was put forward, requiring developers to provide €0.2m/MW in cash or bank guarantees by way of a deposit, in order to initiate the grid construction process.

While it is clear the German Government does want to connect offshore wind farms to the power grid faster and is starting to implement measures to achieve this, there is still a long way to go. A decision on whether the KfW €5b fund can be utilized is not due until mid 2012 and there are no guarantees this will even be sufficient to overcome the obstacles. Further, any substantial infrastructure improvements will inevitably take several years, reducing the current pace of offshore development.

### Solar

In a bid to ensure a maintainable annual installation of 2.5GW-3.0GW, the German Government has again revisited the FIT awarded for solar PV projects and unveiled an accelerated program of cuts. The new round of cuts is effective from 1 April, three months earlier than the scheduled reduction in July, and will apply as follows:

- ▶ Small rooftop (up to 10kW) reduced from €0.244/kWh to €0.195/kWh
- ▶ Large rooftop (10kW-1MW) from €0.219/kWh to €0.165/kWh
- ▶ Ground mounted (<10MW) from €0.179/kWh to €0.135/kWh
- ▶ Plants with capacity in excess of 10MW registered after 1 July will not receive any subsidy

The proposals also include a €0.15/kWh reduction every month from May until the end of the year and a net metering provision which will mean that, from January 2013, support is provided for only 85% of PV plant generation from small rooftop plants up to 10kW and 90% for all other small plants. Large-scale plants (rooftop >1MW and ground mounted <10MW) will still be compensated for 100% of the electricity produced.

While the industry recognizes that tariff reductions are required to keep pace with the falling cost of solar, some critics have claimed the new reductions are unnecessary following the halving of subsidies over the last three years and the additional 15% reduction in January this year. Further, it is being argued that the effects of the latest German Renewable Energy Law, enacted on 1 January 2012, are not yet clear, with no conclusive evidence yet on the pace of expected drops in development costs. As a result, some analysts are querying the urgency of such stringent measures.

Nevertheless, the proposed subsidy reductions will almost certainly result in a strong surge in installations in the first half of this year, after which it is likely that the residential rooftop segment will see the majority of activity.

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## Wind sector growth dampened while solar increases

Ranking	Issue 33	Issue 32
All renewables index	4	4
Wind index	3	4
Solar Index	2	2

Source: Ernst & Young analysis

### Policy

The first quarter of the year has brought mixed signals about the short- to medium- term outlook for India's renewables market. Clean energy investment reached US\$10.3b (€7.7b) in 2011, an increase of 52% on 2010, representing the highest growth rate across any significant economy in the world. However, India still only accounted for 5% of global clean energy investment.

Macroeconomic signals suggest 2012 will increase access to project financing, with easing inflationary pressure likely to lower the cost of borrowing relative to 2011, which experienced a tightened monetary policy in a bid to curb high inflation. Further, budget proposals associated with the country's 12th Five Year Plan (April 2012 to March 2017), reveal the Government's intention to introduce tax exemptions on clean energy technologies such as solar.

However, companies across the renewable energy market had expected to see the sector in a list of industries eligible for priority lending and access to reduced interest rates. Project financing is likely to be made more difficult by the omission of the renewables sector from this element of the budget.

In the Renewable Energy Credit (REC) market, companies had a final opportunity to buy credits before the 31 March cut-off, after which regulators will assess whether the 10% energy from clean sources obligation had been met. Traders had expected to see significantly higher demand as companies rushed to comply; however, demand for RECs fell in March for the third month, suggesting companies are expecting weak enforcement of the obligations.

### Wind

India added a record 3,019MW of grid-connected capacity in 2011, increasing cumulative capacity to 16,084MW, representing a 23% year-on-year increase.

However, new installations in 2012 are expected to drop significantly following the reduction in tax breaks offered to wind power projects at the end of Q1. Farms built from 1 April are only able to claim accelerated depreciation (AD) at 15% of the cost of equipment, down from 80%. The AD tax break had been heralded as being one of the key pillars of India's success in recent years and is credited with having driven 70% of installations last year, according to the Ministry of New and Renewable Energy (MNRE).

However, in recent years, the Government, through MNRE, has been trying to disincentivize the mature capacity-driven market fueled by AD in favor of a generation-driven market, in a bid to prevent wind power projects being treated more as financial instruments rather than power generation assets. The shift of focus toward generation has been supported by a Generation Based Incentive (GBI) support mechanism since 2009; however, uptake has been relatively low given the attractiveness of AD.

The GBI, only ever designed to be a transition mechanism, also expired on 31 March; however, MNRE has applied for Cabinet approval to extend the incentive for a further two years.

MNRE has set a wind power target of an additional 15GW for the 12th Five Year Plan; however, MAKE believes it will be difficult to realize this due to the gestation period required for a full transition to a generation-driven market and policy framework. However, an encouraging project pipeline and improving macroeconomic conditions are likely to support market growth in the medium to long term.

### Solar

The end of January saw the deadline for solar developers in Gujarat state keen to receive the higher PV tariff to complete their projects. India's largest solar program cut the preferential rate it pays to utilities by up to 33% for plants commissioned after 28 January 2012. Gujarat state boasts India's second-highest potential for PV power production. Around 350MW of the 958MW of solar capacity awarded by the state missed the deadline and will therefore receive a rate of INR9.98 (€0.14)/kWh for the first 12 years compared with INR15/kWh previously. The rate will be reduced to INR7 (€0.1)/kWh for the subsequent 13 years.

Solar thermal projects fared better in Q1 following the announcement by the Finance Minister in his annual budget speech that the Government is proposing to scrap import duties on CSP equipment. This will help lower the cost of projects for companies starting to build out the country's planned CSP project pipeline.

India's solar sector is also expected to receive a boost as investors and developers turn their attention away from a troubled European market in search of high-growth developing markets. India's strong project pipeline and untapped resource potential means it is likely to benefit from this shift in global solar investment. Indeed, there are already signs that this is starting to happen; of the US\$10.3b (€7.7b) in clean energy investment in 2011, the largest increase came from the US\$4.2b (€3.1b) funding across the solar industry, representing a sevenfold increase on 2010.

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## Subsidy cuts across all technologies endanger growth

Ranking	Issue 33	Issue 32
All renewables index	5	5
Wind index	7	7
Solar Index	5	5

Source: Ernst & Young analysis

## Policy

The new Italian Government announced in Q1 its intention to reduce renewable energy incentives across a range of technologies, but with particular focus on solar PV. The cuts to PV incentives are aimed at reducing final consumer costs and also reflect the dramatic fall in panel prices in 2011.

In mid April, three ministries (Economic Development, Environment, and Agriculture) presented the first draft of two new decrees which aim to cut the cost of renewable energy incentives by around €3b per year relative to what they otherwise would be under the current system. The drafts also seek to increase Italy's 2020 target to 32%-35% of electricity consumption from renewable sources, up from 26%, exceeding the 2020 EU target.

The fifth "Conto Energia" (covering solar PV FITs) proposes to reduce solar subsidies by about 35%. New spending on incentives will be capped at €500m per year, thus setting the total annual subsidy spending limit at €6.5b. The Conto Energia will come into effect after 1 July 2012 or once the €6.5b limit is reached.

The legislation also seeks to prioritize small installations and limit the number of large plants. Projects >5MW must win competitive tenders to be eligible for FITs and all plants >12kW must register to seek incentives, while smaller installations will be exempt from registration.

The other draft bill, which concerns other renewable energy technologies and would come into force on 1 January 2013, reduces subsidies for all technologies (excluding mini-hydroelectric and geothermal energy) by around 10%-15%. However, it does also increase the limit for yearly subsidies by €2b to €5.5b. Both decrees are subject to modifications by the energy regulator and Council of Regions before being voted into law.

In other policy news, on 2 April, the decree on Regional Burden Sharing was published. This defines, for each Italian region, the targets for primary energy consumption from renewable sources in order to achieve the national target of 17% by 2020. The mandatory nature of the regime and its delegation of final targets to local decision-makers is expected to boost efforts.

## Infrastructure

In January, plans for a 2GW CSP project in Tunisia were developed by **Nur Energie Ltd** and its Tunisian partners, led by **Top Oilfield Services**, which will export electricity to Italy via undersea cables. The first phase of the project, known as "TurNur," will begin in 2014, with electricity generation expected by 2016. Under the "Joint Projects" provisions of the EU Directive on renewable energy, the electricity imported by Italy will count toward the country's 2020 RES obligations. The project will also potentially serve as a blueprint for major projects in the Middle East and North Africa (MENA) region contributing to European countries meeting their renewable energy targets.

## Solar

Italy overtook Germany in 2011 to become the global leader in new installed solar capacity, adding more than 9GW last year alone to take cumulative installed capacity to 12.5GW. It is likely that the impressive scale of additions in 2011 was in part due to a rush by installers to get new plants completed by the end of 2010 and connected by mid 2011 in order to take advantage of higher subsidy levels before the FITs were cut.

Despite the additional cuts to the solar FIT under the latest government proposals, Italy's premium rates for PV will remain about double those in Germany and France for example, across most projects. As such, while investors and project developers may start to look at their options more closely, an overnight exodus away from Italy's solar market is not expected. However, the outcome of the policy changes outlined above suggests that it will be the small rooftop segment of the solar sector that will see the most activity in the coming months.

## Wind

Italy added just over 1GW in new wind power capacity in 2011, taking cumulative installations close to 6.7GW. Analysts forecast an additional 4GW-5GW will be installed in the period 2012-16. The enforcement of the new incentive scheme in 2013 is likely to motivate developers to get projects commissioned before the end of 2012. However, the expected phase out of the Green Certificate (GC) system from 1 January 2013 could impact investor confidence and project commitments in the medium term, even though the new incentive scheme has been announced and is nearing final approval. This is likely to be exacerbated by high public debt restricting the financial markets and anticipated austerity measures through 2012.

There remains strong opposition to offshore wind development on the grounds of potential environmental and economic damage in terms of landscape, fishing and tourism. There is also uncertainty around the regulatory framework, in particular, how the auction system will be structured in terms of scheduling, procedure and remuneration.

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## Another round of solar FIT cuts but offshore booming

Ranking	Issue 33	Issue 32
All renewables index	6	6
Wind index	5	5
Solar Index	19	19

Source: Ernst & Young analysis

### Policy

In early April, DECC announced that it would be launching a £1b (€1.2b) carbon capture and storage (CCS) funding competition in a bid to support and commercialize CCS projects. A similar funding competition was run last year but failed to finance a single project. The plans have raised queries about the UK's commitment to renewables, amid speculation that DECC is considering natural gas to be a possible bridge fuel for the country for the foreseeable future. This has caused concern across the green energy sector that the Government will shift its focus toward gas as an alternative to renewables.

### Grid

Q1 saw a big boost for the future of the UK's transmission network, and in particular, the ability to connect Scotland's substantial future offshore wind portfolio to the grid. In late January, the energy regulator signaled that it was likely to approve plans for a £7b (€8b) upgrade of Scotland's grid to ease the integration of renewables onto the UK grid. Ofgem fast tracked the consultation on an infrastructure investment proposal put forward by ScottishPower and SSE which could see £2.9b (€3.5b) of investment with up to a further £4.7b (€5.6b) between 2013 and 2021.

Also in Q1, Iberdrola, through its subsidiary ScottishPower Transmission, and Britain's transmission system operator National Grid, awarded a £1.0b (€1.2b) contract to Siemens and cable manufacturer Prysmian to build the first ever sub-sea electricity link between Scotland, England and Wales. The 2.2GW sub-sea interconnector will enable export of wind power and other renewable energy from Scotland to key demand centers further south, although the link will be bi-directional, allowing electricity to flow north or south according to future supply and demand. The link would be the longest high capacity, high voltage direct current cable in the world.

### Wind

The future of onshore wind in the UK appears to have sparked political debate within the Government, with 100 backbench Conservative MPs signing a petition against plans to build large-scale wind farms across the UK and calling for subsidies for "inefficient" onshore wind power to be slashed. The Prime Minister's response reinforced the role of onshore wind in diversifying the country's energy mix and repeated the Government's existing policy that it will cut subsidies to onshore wind by 10% in the near future in recognition that the installation cost has fallen.

### Offshore wind

The future of offshore wind, on the other hand, seems to be more certain. Q1 saw the opening of the 367MW £1.0b (€1.2b) Walney wind farm off the Cumbrian coast, claimed to currently be the world's largest offshore wind farm. The project marks another

milestone in the £33b (€40b) push to expand sea-based generation in the UK more than 10-fold by the end of the decade. Also in Q1, the first of 175 turbines has been erected in the Thames Estuary, marking the beginning of the giant London Array wind project. London Array hopes to complete the first 630MW phase by the end of 2012, after which phase two should take total capacity to a record 1,000MW.

The 270MW £1.0b (€1.2b) Lincs offshore wind project, led by Dong, Centrica and Siemens, secured over £400m (€479m) of debt to make it the first limited recourse construction financing for a UK offshore wind project. Meanwhile, Samsung has announced that it intends to open a new £100m (€120m) wind turbine facility in Scotland where it will develop its new 7MW offshore wind turbine.

### Solar

Following in the footsteps of other European markets, the UK is seeking to bring down PV tariffs through regular and predictable cuts. DECC has reduced the tariff from £0.43 (€0.53)/kWh to £0.21 (€0.26)/kWh for installations up to 4kW, from 1 April 2012. A further 35%-40% cut across various scale installations is proposed from July this year depending on the amount of capacity installed in May and June. The plans suggest deeper cuts for installations >4kW, reducing the tariff range to £0.047-£0.132 (€0.57-€0.16) per kWh from the current £0.089-£0.168 (€0.11-€0.21) per kWh. The proposal also raises the prospect of a further 5% reduction in October, followed by a degression rate of 10% every six months. DECC's proposals entered a consultation period ending 3 April, the results of which were unannounced at the time of writing.

While these proposed cuts are causing gloom across the UK's solar sector, a Supreme Court ruling earlier in the quarter overturned the Government's appeal against a previous ruling that tariff cuts at the end of 2011 were "unlawful." This has given the sector some comfort, sending a clear message that retrospective and short-notice revisions to support subsidies is not acceptable. However, the decision, which marked the third legal defeat of the Government, could make it increasingly likely the FIT scheme budget will be exceeded this year and that the second round of cuts will go ahead later this year.

### Wave and tidal

The UK is continuing to lead the way in developing a commercial market for marine technology in a bid to harness the potential 27GW of power that could be generated from waves and tides by 2050. In Q1, the Crown Estate, owner of the UK seabed, awarded three sites in Scotland to marine energy developers, while Scotland's first near shore commercial wave power array also received approval. Also in this quarter, Swedish utility Vattenfall signed an agreement to develop a wave energy test project off the Orkney Islands in Scotland, and it was confirmed that the UK's first marine energy park will be developed along the country's southwest coastal region.

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## Bidding zones refocus supply, Norway joins GC scheme

Ranking	Issue 33	Issue 32
All renewables index	12	12
Wind index	9	9
Solar Index	27	27

Source: Ernst & Young analysis

### Policy

In the last six months, two key events have had an impact on the Swedish renewable generation market; the division of Sweden into four bidding areas and Norway's affiliation to the Swedish GC system.

#### Four bidding zones

At the end of 2011, Sweden was divided into four separate bidding areas (Luleå SE1, Sundsvall SE2, Stockholm SE3 and Malmö SE4) following an agreement between the EC and the Swedish national grid company, Svenska Kraftnät. The partition of the market provides a more distinct view of supply and demand in different regions as well as where the grid needs to be expanded.

The borders between the different regions are located in areas where limitation in transmission capacity is severe. Traditionally, the northern part of Sweden has a surplus of electricity compared with shortages in the south. This is due to demographic factors as well as the northern regions holding the majority of installed hydroelectric capacity. The inadequate transmission in the southern zones has driven up power prices and impeded renewable energy development. It is hoped that the introduction of the four zones will incentivize and focus the installation of new generation capacity in the SE3 and SE4 areas.

#### Sweden-Norway GC system

On 1 January 2012, Norway joined the Swedish GC system, creating the first two-country market for GCs, the success of which is difficult to predict. The common goal is to bring 26.4TWh of renewable energy generation on line in the Nordic electricity market by 2020. The scheme will continue to offer one GC per MWh of renewable generated electricity.

With Norway entering the system, a larger certificate market is created with the clear intention to increase liquidity, lower price volatility and improve competition. It should also lead to a more efficient use of all renewable resources in Norway and Sweden.

However, the currently low GC price and expectations that new renewable energy capacity in Norway will not be built particularly quickly, indicates that Norway's effect on the new joint GC market will start to be seen around 2014-15, with Swedish certificates starting to expire in 2013 and Norwegian demand expected to pick up. In the short term, however, the lack of demand is resulting in a surplus of certificates which, is dampening the GC price. The average GC price through January-February 2012 was €19/MWh per GC, compared with an average of €28/MWh in 2011. The medium- to long-term outlook is, however, more optimistic.

### Financing

Sweden's finance markets appear to have emerged from the global economic recession relatively unscathed, and support for clean energy projects in particular remains robust and growing.

Most of the Nordic banks are active in financing wind projects on a non-recourse project finance basis. At the end of 2011, private equity fund manager Platina Partners LLP and Swedish onshore wind developer Arise Windpower, completed Sweden's largest ever wind project financing, the €336m 200MW Jädraås windfarm. International banks, export credit agencies and some international financial institutions are also becoming increasingly active in financing Swedish wind projects. Relatively low electricity and certificate prices are currently setting an effective limit on how much gearing can be achieved, and for the time being mini-perm structures (two-year construction loan and five-year term loan) are dominating.

A ranking released by BNEF earlier in the year showed that Skandinaviska Enskilda Banken AB, along with Japan's Daiwa Securities Group Inc., had underwritten the most green bonds since the securities were first issued in 2007, reinforcing the dominance of Swedish banks in the green bonds market. Along with Japan, Swedish banks were among the first to design securities tailored to suit projects related to the environment and renewable energy.

### Wind

Sweden experienced a record 763MW of new installed capacity in 2011, completing seven years of consecutive growth year on year and taking cumulative capacity to almost 3GW. Analysts forecast 4GW-5GW of new capacity in the period 2012-16 based on accelerated onshore construction activity and increased order activity in 2011. Sweden's relatively untapped onshore wind potential and the efficient GC scheme continue to drive market expansion, with around 1GW of projects under construction and another 1.3GW fully approved.

It is likely that the rapid market growth in 2011, and continuing through 2012, is mainly a result of contracts signed in 2009-10 when the GC price was higher (average €33/MWh) now entering the installation phase. The current decreasing GC price reflects the oversupply of certificates as a result of increasing renewable energy generation. As such, MAKE expects wind power installations to slow in the short to medium term until GC prices pick up as they are predicted to do.

While other markets in northern Europe (e.g., Germany, Denmark and the UK) will be shifting focus toward offshore wind, it is likely Sweden's market growth will primarily be onshore. While there is strong offshore potential, the current GC mechanism does not differentiate between technologies and therefore remains low to support offshore wind power development. Analysts forecast that only 0.5GW-1.5GW of offshore projects are likely to be brought on line in 2013-16.

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## New subsidy scheme could prevent diverse energy mix

Ranking	Issue 33	Issue 32
All renewables index	22	22
Wind index	17	15
Solar Index	30	27

Source: Ernst & Young analysis

### Policy

March saw the launch of the first phase of the Netherlands' new competitive subsidy scheme. The SDE+ regime awards the total annual subsidy budget in different rounds, with increasing subsidy tariffs. The tightening of the SDE+ scheme for 2012, therefore, gives preference to projects willing to agree lower subsidy tariffs. However, the technology-neutral nature of the scheme means different renewable energy technologies are competing against each other for a limited budget. The first phase at the lowest subsidy level attracted applications totaling €2.0b, higher than the €1.7b budget for 2012.

Other changes to the SDE+ scheme in 2012 include the eligibility of heat generating projects and cogeneration based on gasification and geothermal to apply for the subsidy, and the permitted carryover of eligible production not used into the following year. The subsidy for onshore wind energy has been differentiated according to wind speed, and domestic consumption of self-generated energy has been stimulated.

However, there is a concern that the lack of technology differentiation and the structure of the subsidy round could result in overemphasis on cheaper technologies such as onshore wind, to the detriment of more expensive or less mature technologies, such as offshore wind and solar PV. As such, the diversification of the country's energy mix will remain limited and development of these maturing technologies will be stalled in favor of cheaper projects.

### Finance

At the end of last year, a legislative proposal (Regels voor opslag duurzame energie) was sent to the Dutch House of Representatives recommending a new tax on the consumption of electricity and natural gas. The new tax will be an addition to the existing energy tax and will increase charges for both households and businesses. The proceeds from this tax are intended to finance the stimulation of renewable energy production.

### Wind

The Netherlands added 68MW of new wind power capacity in 2011, bringing cumulative capacity to 2.3GW. Analysts forecast 1GW-2GW of new capacity will be installed in the period 2012-16 as a result of the likely boost to large-scale onshore projects provided by the new subsidy scheme. The 2012 SDE+ offers its first phase an onshore subsidy of €0.088/kWh, increasing to €0.120/kWh differentiated by wind speed.

However, relatively high onshore saturation and continuing public opposition to wind power development could reduce installation levels in the long run, with increased emphasis on repowering.

## Offshore wind

A number of offshore projects secured under tenders in 2009 are due to be installed post 2012. At the end of last year, Dutch utility Eneco managed to secure the required subsidy for the permit it holds to build a 43 turbine 129MW offshore wind park. This subsidy is the remaining budget available from the 2009 offshore wind energy tender (Regeling windenergie op zee 2009), which had a total subsidy budget of around €5.4b. Two subsidies totaling €4.4b were awarded in 2010 to BARD (subsequently sold to Typhoon Offshore); the remaining budget of c. €1.0b has been awarded to Eneco and construction is expected to begin in late 2013.

However, the marginal chances for offshore wind to receive support under the new subsidy scheme could stall the market growth beyond these projects. The extension until 2020 of a number of offshore permits (Wet Beheer Rijkswaterstaat vergunning permits) due to expire between September and December 2012, provides developers with additional time to complete their projects and may help the Netherlands realize its 6GW offshore target by 2020.

## Solar

The Dutch solar energy sector has continued to experience difficulties in the first quarter of 2012, with several solar panel producers and installers going into administration or being forced to restructure in the face of solar panel and cell price reductions of 80% and 50% respectively, as well as regulatory changes in a number of core solar markets.

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## Wind and solar promotion office launched as tariffs cut

Ranking	Issue 33	Issue 32
All renewables index	26	25
Wind index	28	27
Solar Index	26	24

Source: Ernst & Young analysis

### Policy

In late March, Taiwan's Ministry of Economic Affairs (MOEA) officially inaugurated its first solar and wind promotion office in Taipei City as part of its "Office of a Million Solar Rooftop PVs and a Thousand Wind Turbines Promotion." The initiative aims to integrate related resources for harnessing renewable energy and provide professional assistance to resolve barriers that are hindering the installation of renewable energy generation systems. It will also play a role in developing new business and providing information on financing, insurance and maintenance services.

According to the MOEA, this initiative will help the market to double its green power capacity to 16% by 2020 with installed capacity reaching 6.5GW by 2035. It also estimates it will create TWD500b (€13b) in associated business for the sector.

However, this milestone event for Taiwan's green energy sector comes in the same quarter as the Government's annual review of power prices for renewable energy projects, resulting in a number of revisions to the preferential rates secured by different technologies. Further, the February announcement confirmed rates would now be changed twice a year as opposed to annual changes as previously.

### Wind

Taiwan installed 45MW in 2011, taking cumulative installed capacity to 551MW. Analysts forecast 500MW-800MW of new capacity in the period 2012-16; however, the market has very clear targets in mind as part of its Thousand Wind Turbines Promotion initiative, launched back in July 2011. It aims to install 450 onshore wind turbines by 2020 and 600 offshore turbines by 2030, in order to boast a total installed wind power capacity of 4.2GW by 2030.

The key tasks of the new promotion office supporting the program will be to identify regulatory hindrances and propose possible resolutions, to execute offshore wind power demonstration projects and to help the development of the domestic wind power industry.

Given Taiwan's population density and mountainous terrain, it is likely that suitable onshore wind sites will be exploited relatively quickly. As such, the majority of new installations post 2015 are likely to be in the offshore sector. However, there are some concerns that the current offshore FIT of TWD5.56 (€0.14)/kWh is still regarded by developers as too low given the risks and uncertainty of offshore development.

Reaching the 1,000 turbine target may also be made harder given Q1 saw a fall in the FIT for wind farms with capacity greater than 10kW, albeit by less than 1%, to TWD2.60 (€0.07)/kWh. The FIT rate for wind applications of 1kW-10kW capacity remains unchanged at TWD7.36 (€0.19)/kWh.

### Solar

By the end of January 2012, solar PV installation in Taiwan had reached 102MW. Under the Million Solar Rooftop PVs Promotion initiative, the Government hopes to install 420MW of PV systems by 2015, 1,020MW by 2020 and 3,100MW by 2030. The program will provide specific information and consulting services for the public and power grid integration support.

As with wind, the reduction in preferential rates for solar power may hinder the progress of the initiative in the short term. Wholesale rates for 2012 solar contracts were cut by as much as 8.3%. Rooftop projects installed by June will receive TWD7.33-TWD9.46 (€0.17-€0.24)/kWh depending on the scale of the installation, while ground based plants complete by June will receive TWD6.90 (€0.18)/kWh, representing a 6.0% reduction. After June, rates will fall a further c.2% relative to last year.

### Biomass

The Government increased preferential power prices for biomass projects by as much as 24%. Wholesale prices for biomass electricity sold to Taiwan Power Co., the monopoly grid operator, rose to as much as NT\$2.70 (€0.07)/kWh.

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## New RES law on the horizon and strong signs of activity

Ranking	Issue 33	Issue 32
All renewables index	38	38
Wind index	34	36
Solar Index	33	34

Source: Ernst & Young analysis

### Policy

In February 2012, Chile's Government launched its 2012-30 National Energy Strategy, which aims to increase energy security (currently Chile imports 75% of its energy) as well as meet a rapidly growing energy demand. The new strategy is built on six pillars, which broadly cover strengthening the renewable energy sector and promoting energy efficiency, ensuring a greater role for the hydropower sector, greater attention on the public transmission grid and creating a competitive electricity market.

As part of the strategy, a bill is currently being considered by the Lower House after being passed by the Senate in January, which would increase the country's target electricity from RES to 20% by 2020, up from the current mandate of 5% (due to increase to 10% by 2024). If the bill is passed, it will represent Latin America's most ambitious renewable energy law and could spur as much as US\$10b (€7b) in investment required to develop at least 4GW of renewable power capacity by 2020.

It is expected that the Renewable Energy Center (CER), a Government entity dedicated to promoting clean energy, will play a significant role in helping the country meet this target and strengthening the country's position as an attractive location for foreign renewable energy investors.

The bill also calls for auctions of long-term contracts, to sell power from specific renewable energy sources based on technology quotas, to be carried out every two years. This tendering system would replace the current renewable portfolio system and will also represent a change to the tariff-setting system. Instead, it will rely on tariff offers from bidders based on a 12-year term from the proposed commercial operation date.

It is hoped that the tendering system proposed in the bill, if passed, will allow projects that have the required permits and approvals (but have not yet entered into PPAs) to start construction and operations, thereby speeding up the implementation of the country's strong project pipeline. While Chile currently has only 649MW of renewable energy capacity based on Q1 figures, it has another 220MW under construction (all wind), 2.4GW in proposed plants that have already obtained environmental permits and a further 2.0GW of renewable capacity currently undergoing environmental assessments.

The new energy strategy also calls for the expansion of government support mechanisms and assistance with funding RES projects both domestically and attracting foreign investment. However, some energy developers have been disappointed by the lack of detail in the Government's new energy strategy, claiming that it sets lofty objectives for expanding renewable energy generation but offers few specifics on how they will be achieved. Further, the strategy fails to set deadlines for enacting the specific measures set out in the strategy.

The plan does contemplate implementing 100 specific measures to attain the objectives of the strategy, but critics charge that, without having the details in place, potential investors will find it difficult to make the necessary commitments. Further, the sector will continue to face obstacles such as the limited possibilities for financing, signing long-term contracts and connection to the grid system.

Nonetheless, the strategy and the legislation expected to reach the President's desk later this year, send strong policy signals of Chile's commitment to renewable energy. If implemented, it will likely spur exploitation of Chile's significant untapped resources and trigger development of a strong project pipeline.

### Wind

The pace of wind power development in Chile looks set to quicken in the short to medium term. The country is estimated to have wind power potential totaling 40GW thanks to its 6,500km coastline and strong sea breezes, and the Chilean Energy Ministry claims it has received applications for about 2GW of new wind power capacity to be installed through to 2014. Analysts forecast new capacity totaling 1GW-1.5GW will be installed in the period 2012-16 but note that a project pipeline of around 4GW is beginning to see movement as policy appears to be coming into place.

Chile's wind sector is already attracting key players in the market. Enel Green Power recently secured a concession to operate a 99MW wind farm and has plans for up to 360MW, while Ireland's Mainstream Renewable Power will be developing a 240MW project using turbines produced by China's Xinjiang Goldwind Science & Technology Co.

### Solar

Chile's solar market is also attracting strong interest across both the PV and CSP sectors – Chile's National Energy Commission estimates that the northern region has 200GW of solar power potential, which has caused an influx of developers.

Chilean renewable firm Fotones de Chile has submitted plans for a US\$400m (€300m) solar plant with capacity of 180MW developed over six phases, while Spain's Ingenostrum aims to build six solar PV plants totaling 688MW in the Antofagasta region of northern Chile, at an estimated cost of US\$2b (€1.5b). The company presented environmental impact studies for the project on 2 April and the outcome should be known by the end of June this year.

Meanwhile, Spain's Ibereolica is seeking permits to build a 360MW CSP plant worth US\$2.6b (€1.9b) in the same region. Also in the CSP pipeline, Atacama Solar is planning a 225MW facility and Gener a 220MW solar park.

### Other

Q1 has witnessed a continued high level of interest in the country's geothermal resources by companies such as Origin Energy Ltd, Enel, Energia Andina SA and Geoglobal Energy LLC. Meanwhile, proposals to construct small hydropower plants with total capacity of 1GW will be submitted for environmental evaluation over the next few months.

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# Appendix – February adjusted indices

Given significant growth in the solar sector this past year, we have adjusted the weightings allocated to the different technologies comprising the ARI. These revised weightings are based on a re-examination of current investment proportions and installed capacity, as well as forecasts based on a four-to five- year investment horizon. The fall in offshore wind and CSP weightings reflect these markets not growing as fast as anticipated previously.

The revised weightings broadly resulted in positive score movements for countries with stronger solar resource or potential, and vice versa for wind-heavy countries. Notable rises in the ARI score include India, Japan, Morocco and Israel. Notable falls were UK, Denmark, Ireland and Norway.

	Previous weighting	Adjusted weighting
Onshore wind	48%	45%
Offshore wind	17%	10%
Solar PV	13%	28%
Solar CSP	5%	4%
Biomass and waste	10%	8%
Geothermal	2%	2%
Marine/small hydro	2%/3%	1%/2%

The table below sets out the issue 32 scores adjusted to reflect the revised technology weightings. These adjusted scores and rankings form the basis of scoring for issue 33.

Rank <sup>1</sup>	Country	All renewables	Wind index	Onshore wind	Offshore wind	Solar index	Solar PV	Solar CSP	Biomass/ other	Geo-thermal	Infra-structure <sup>2</sup>
1 (1)	China	70.6	77	79	70	64	67	47	60	51	75
2 (2)	US	69.4	68	71	57	74	74	75	63	69	65
3 (3)	Germany	66.4	69	67	80	61	70	0	69	58	74
4 (4)	India	65.5	66	71	43	67	69	54	62	45	67
5 (6)	Italy	58.4	59	61	50	60	62	41	53	61	56
6 (5)	UK	55.8	64	61	80	42	48	0	58	36	66
7 (7)	France	55.6	58	59	54	52	56	29	57	33	55
8 (8)	Canada	53.8	63	67	46	40	46	0	50	36	65
9 (10)	Brazil	49.8	53	56	40	45	46	33	54	24	50
10 (11)	Australia	49.5	49	51	38	53	53	54	43	57	47
11 (11)	Spain	49.2	48	51	36	54	53	60	44	27	38
12 (9)	Sweden	48.9	55	55	53	37	42	0	58	35	55
13 (16)	Japan	48.8	46	48	39	57	61	27	39	46	52
14 (13)	Romania	47.6	53	56	39	40	45	0	45	41	46
15 (14)	South Korea	46.6	47	46	53	48	51	29	41	36	45
16 (14)	Poland	46.2	53	56	41	36	42	0	43	22	47
17 (21)	Greece	44.9	45	48	33	49	51	33	34	25	32
18 (16)	South Africa	44.8	49	52	36	42	41	50	36	34	48
19 (21)	Portugal	44.4	46	48	34	46	47	35	38	25	38
20 (16)	Belgium	44.3	51	49	58	36	42	0	39	27	50
21 (24)	Mexico	43.0	44	45	39	43	43	40	39	54	39
22 (21)	Netherlands	42.9	49	49	49	37	42	0	37	21	41
23 (19)	Denmark	42.4	46	44	58	35	40	0	46	33	52
24 (19)	Ireland	42.1	52	52	50	26	30	0	43	23	48
25 (27)	Taiwan	41.3	44	45	39	39	44	0	37	38	43
25 (30)	Morocco	41.3	39	42	26	48	47	54	38	21	42
27 (24)	Norway	40.0	48	48	46	26	29	0	45	30	51
28 (32)	Ukraine	39.8	39	41	27	40	46	0	46	32	41
28 (27)	Egypt	39.8	42	44	31	39	39	44	34	24	32
28 (30)	Turkey	39.8	41	43	32	38	40	28	35	41	37
31 (33)	Austria	39.7	35	39	0	44	50	0	50	33	49
32 (26)	Finland	39.6	46	48	39	24	28	0	53	26	47
33 (27)	New Zealand	39.5	47	50	37	27	31	0	34	51	47
34 (34)	Tunisia	36.8	36	38	27	44	44	48	20	27	41
35 (34)	Bulgaria	36.5	36	39	24	37	42	0	35	34	39
36 (37)	Israel	36.1	33	37	14	45	46	38	26	28	38
37 (34)	Argentina	34.9	37	40	22	33	36	17	32	27	34
38 (39)	Hungary	34.0	34	38	0	31	35	0	43	39	36
39 (38)	Chile	33.4	35	38	23	32	34	19	28	36	40
40 (40)	Czech	32.6	34	38	0	31	36	0	31	23	46

Source: Ernst & Young analysis

Notes:

1. Ranking in original Issue 32 publication is shown in brackets.
- 2-4. Notes on page 20 apply.

# 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 and political 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. This parameter also considers the relative level and consistency of political support for renewable energy, including national targets and financial incentive schemes.
- ▶ 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. The access to finance parameter incorporates sovereign credit ratings and sovereign credit default swaps in conjunction with qualitative analysis.

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

## Technology factors

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

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

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

1. Power offtake attractiveness (19%) – this includes the price received, the potential price variation and length of PPAs granted. Higher scores are also achievable if a government guarantees the power offtake rather than merchant offtakers.
2. Tax climate (11%) – favorable, high-scoring tax climates that stimulate renewable energy generation can exist in a variety of forms and structures. The most successful incentives and structures have been direct renewable energy tax breaks or brown energy penalties, accelerated tax depreciation on renewable energy assets and tax-efficient equity investment vehicles for individuals.
3. Grant 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).
5. It should be noted that the market growth potential score is based on a view taken of a range of business analysts’ forecasts and Ernst & Young’s own market knowledge. There is significant variation between analysts’ views on each market and the forecasts used are a market view only – the scores in no way guarantee that the forecast capacity will be built.
6. 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.
7. Resource quality (19%) – for example, wind speeds and solar intensity.
8. Project size (15.5%) – large projects provide economies of scale and a generally favorable planning environment, which facilitates project development financing.

For more details on the CAI and previous issues, please visit [www.ey.com/CAI](http://www.ey.com/CAI)

# Glossary

Abbreviation	Definition
AD	Accelerated depreciation
ARI	All renewables index
b	Billion
BNEF	Bloomberg New Energy Finance
BoP	Balance of payments
CAI	Country attractiveness indices
CCS	Carbon capture and storage
CEO	Chief executive officer
CER	Renewable Energy Center
CFO	Chief finance officer
COO	Chief operating officer
CSP	Concentrated solar power
DECC	Department of Energy and Climate Change
DOE	Department of Energy
EBIT	Earnings before interest and tax
EC	European Commission
EED	Energy Efficiency Directive
EMEIA	Europe, Middle East, India and Africa
ESA	Efficiency Services Agreement
ESCOs	Energy service companies
ESO	Energy saving obligation
EU	European Union
FIT	Feed-in tariff
GC	Green Certificate
GDP	Gross domestic product
GBI	Generation based incentive
GM	General manager
GW	Gigawatt
ICT	Information and communication technology

Abbreviation	Definition
IEA	International Energy Agency
IFSC	International Financial Services Centre
IPO	Initial public offer
IRR	Internal rate of return
ITC	Investment Tax Credit
JV	Joint venture
kW/kWh	Kilowatt/Kilowatt hour
LED	Light emitting diode
MAKE	Make Consulting
m	Million
M&A	Mergers and acquisitions
MENA	Middle East and North Africa
MNRE	Ministry of New and Renewable Energy
MOEA	Ministry of Economic Affairs
MW/MWh	Megawatt/Megawatt hour
Ofgem	Office of the Gas and Electricity Markets
OES	Ocean Energy Systems
OTEC	Ocean thermal energy conversion
PACE	Property Assessed Clean Energy
PPA	Power purchase agreement
PTC	Production Tax Credit
PV	Photovoltaic
REC	Renewable energy credit
RES	Renewable energy sources
ROC	Renewable Obligation Certificate
RPS	Renewable Portfolio Standard
t	Trillion
TWh	Terawatt hours
VAT	Value added tax

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# Ernst & Young services for renewable energy projects

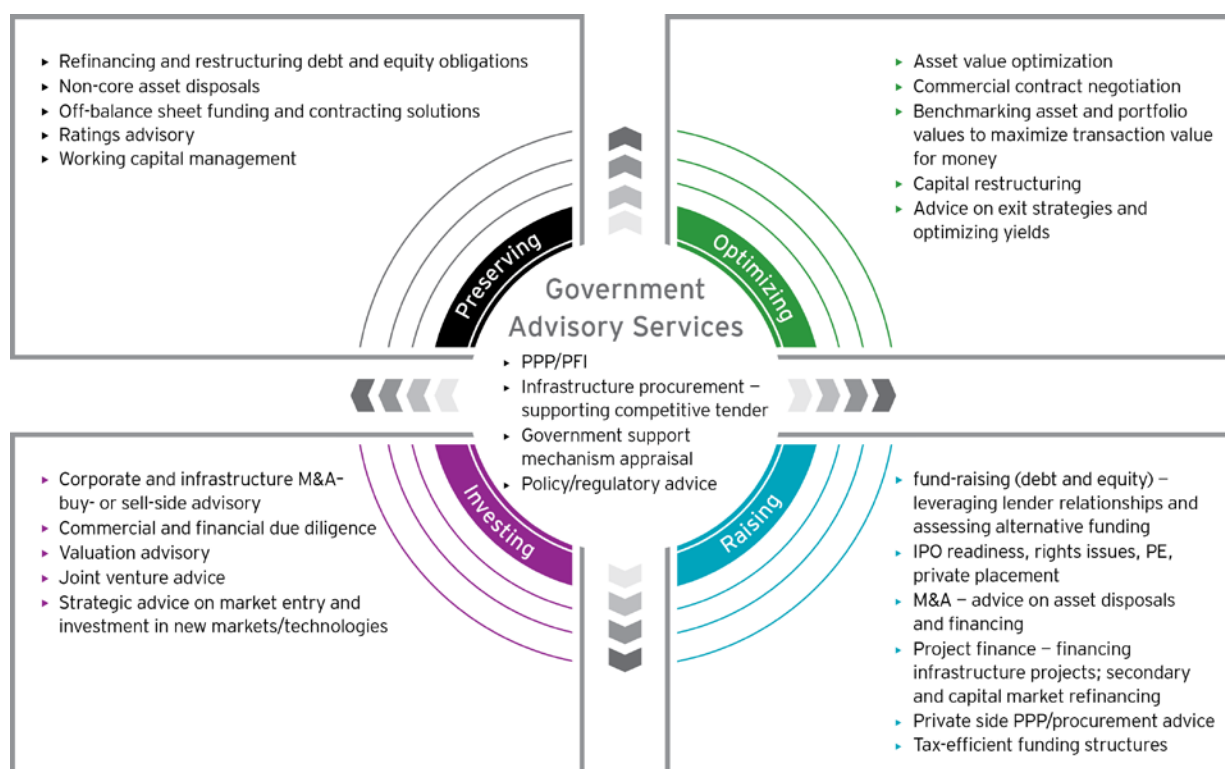
Ernst & Young provides in-depth knowledge and proven expertise for a range of services related to renewable and clean energy technologies. Our offerings can be broadly categorized under four services:

- ▶ Government advisory
- ▶ Project finance
- ▶ Infrastructure mergers and acquisitions (M&A)
- ▶ Corporate M&A

We work with many businesses and governments worldwide to address the renewable energy issues of today and anticipate those of tomorrow. Our experience spans over more than 20 years, covering every renewable energy technology, energy from waste and decentralized energy generation and energy efficiency.

Our unique expertise and unparalleled track record of delivering successful transactions, enables us to connect buyers and sellers, funders and sponsors, and lenders and borrowers across all corners of the globe.

The diagram below summarizes the key cross-border service offerings provided by the Energy and Environment for renewable energy projects.



# Contacts

For further information on our services and points of view, please visit our websites [www.ey.com/renewables](http://www.ey.com/renewables) or [www.ey.com/CAI](http://www.ey.com/CAI) or contact:

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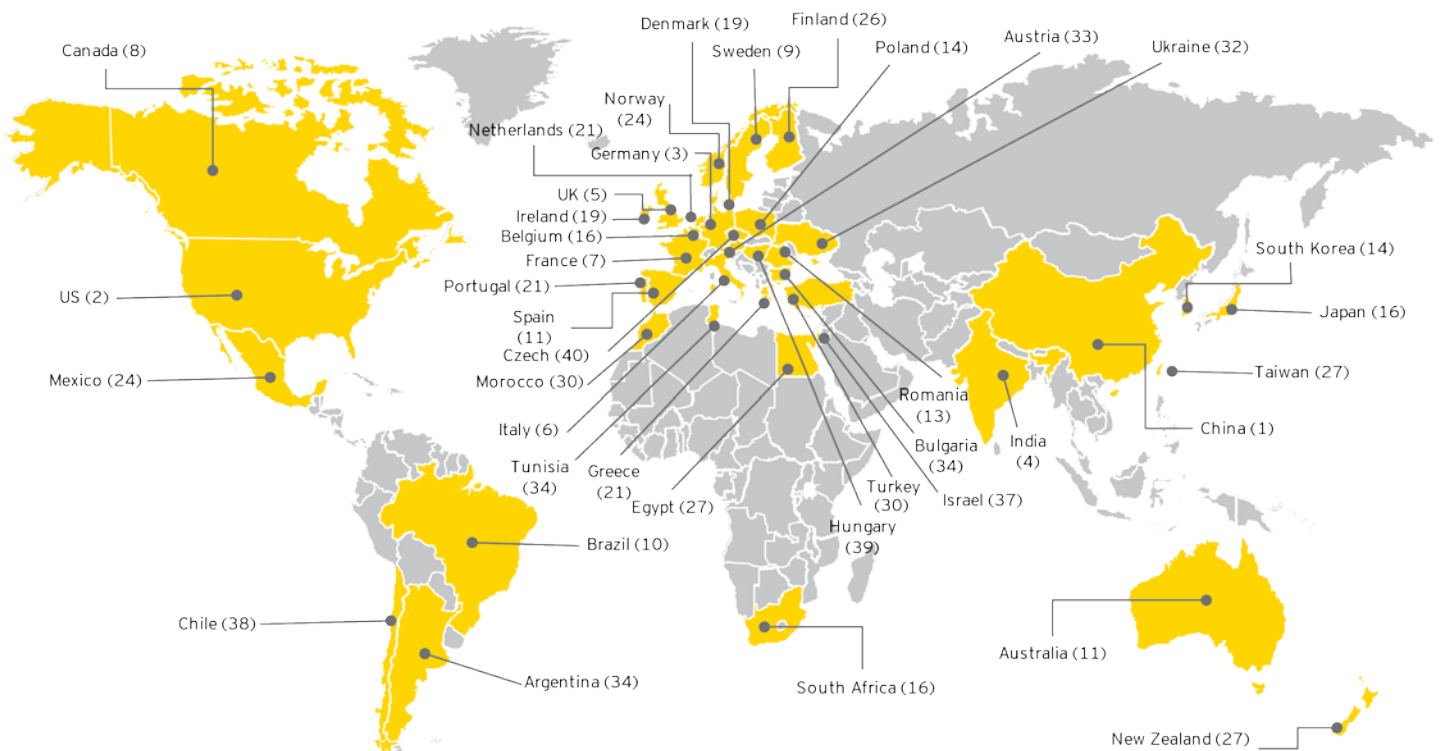
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Map highlighting CAI countries and their respective Issue 33 rankings





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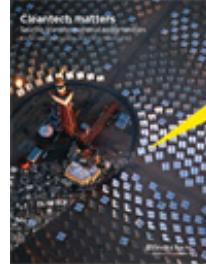
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