

# Renewable energy country attractiveness indices



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## Global highlights

The start of a new decade gives us an opportunity both to reflect on the changes which have taken place within the renewable energy industry over the last 10 years, and speculate on what the next 10 years may hold. Our guest columnist Jonathan Johns considers these issues on page 3.

This issue sees the UK climb two points in the All renewables index to tie with Spain, on the back of marked improvements to the industry for renewable energy development. The UK government announced its plans to extend its Renewables Obligation Scheme up to 2037 and its pledge for a 20-year support for new projects, effective from April 2010, combined with renewed investment into the grid network. January 2010 also saw the Crown Estate granting development licenses for each of the nine Round III zones, totalling 32GW of offshore wind capacity. The Department of Energy and Climate Change (DECC) also announced index-linked feed-in tariffs supporting a range of smaller scale (up to 5MW) renewable investments.

Germany has fallen two points in the All renewables index following news that solar PV may face tariff cuts in excess of the annual depression. There has been political debate in relation to the appropriateness of supporting PV despite relatively low solar irradiation and lower supply chain costs. The government is also concerned about the loss of arable land to PV developments.

The Netherlands saw a three point rise in the All renewables index, moving above Poland, owing to the new 2010 SDE. The government also budgeted €5.3b to support offshore tariffs in 2010 to stimulate the rollout of offshore wind projects. These tariffs will be available on a tender basis. The European Investment Bank (EIB) will also provide €300m of funding for a Netherlands-UK interconnector project.

This quarter has seen the Copenhagen summit come and go, leaving many people questioning its impact. Our feature article on page 22 of this issue tries to explain some of these impacts.

Ernst & Young was ranked the leading project finance advisor in the Americas, Europe, Middle East and Africa between 2001 and 2008 by Project Finance International.



## Overview of indices: issue 24

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

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

The country attractiveness indices take a generic view, and different sponsor/financier requirements will clearly affect how countries are rated. Ernst & Young's Renewable Energy Group can provide detailed studies to meet specific corporate objectives. It is important that readers refer to the guidance notes set out on pages 24-25 when referring to the indices.

### Long-term indices

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

### All renewables index

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

- ▶ Wind index – 68% (comprising onshore wind index and offshore wind index)
- ▶ Solar index – 15% (comprising solar PV index and solar CSP index)
- ▶ Biomass and other resource index – 17%

### Individual technology indices

These indices are derived from scoring:

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

### Renewables infrastructure index

This provides an assessment of the general regulatory infrastructure for renewable energy by country (see page 9).

### Technology factors

These provide resource-specific assessments for each country (see page 9).

### Long-term wind index

This index is derived from scoring:

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

### Long-term solar index

This index is derived from scoring:

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

### Near-term wind index

The near-term wind index takes a forward-looking, two-year view based on the parameters of most concern to a typical investor seeking to make a near-term investment. The index is based on separate scores for onshore and offshore wind. For parameters and weightings, see page 25.

### Comments and suggestions

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

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# Renewables – the last 10 years; lessons for the future?

*Jonathan Johns, Guest Columnist*

In my last article, "It's not all down to Copenhagen," I suggested that the summit was unlikely to deliver all the answers and that a 12- to 15-month time-frame would be needed to make global progress. That has turned out to be the case, with the prospect that post-Copenhagen conferences will face material challenges. As we enter the next decade, it is perhaps salutary to remind ourselves of the progress made in the last 10 years, notwithstanding the relatively slow pace of global progress (such as the time taken to achieve ratification of Kyoto), and to anticipate what may come. In the past decade, the renewables industry has been able to achieve stunning levels of compound growth – despite occasional regulatory setbacks – and is likely to grow strongly in the next decade as it enters the mainstream energy supply.

At the close of the last millennium, post the Rio summit and Kyoto, support mechanisms for the generation of electricity from renewables had been put place in many of the world's developed global economies, making them a commercial proposition – but only where government support was adequate.

In countries with strong feed-in tariffs such as Germany, Denmark and Spain, both renewable manufacturing industry and installed capacity tended to flourish. Those with quota-based tendering systems, for example the UK, France and Ireland, tended to have lower levels of capacity installed and few manufacturing facilities. In the US, a stop-start tax-based system, the PTC, when on tap, led to large capacity build but less growth in manufacturing capacity itself. With the exception of India, the emerging markets were barely on the horizon.

Hence in 2000, in the wind sector the top five wind turbine manufacturers were drawn from Denmark, Germany and Spain, and the top solar manufacturers from Japan, Germany, Spain and the US – all of which had strong campaigns for rooftop PV.

By today's standards, there were no real global players among operators, although strong national and regional champions were emerging in Spain and the US in particular, and these vied to assemble portfolios of circa 1000MW.

It is interesting to reflect on the expectations in 2000 for the coming decade. At that time in the wind sector, nearly 50% of shipments were for sub 750kW turbines with total global wind capacity amounting to about 18GW. Globally, growth was expected to exceed 20% per annum. In Europe, offshore wind was expected to become well established and to take a significant proportion of installations by 2010.

Concentrating solar power and thin film solar were viewed as embryonic technologies, likely to challenge conventional PV only towards the end of the decade. Total solar deployment in 2000 was only around 290MW.

Conventional biomass electricity generation was expected to flourish, with few concerns expressed about the sustainability of fuel supplies. Gasification, pyrolysis and anaerobic digestion were viewed as promising, but difficult to finance.

Wave and tidal were seen as technologies that would in all probability need the next 10 years to prove themselves.

Furthermore, it was anticipated that there would be a shift in installed capacity towards the US, with the Asian market starting to become established. Europe was anticipated to still predominate, mainly due to the strength of its support mechanisms.

In terms of government policy, deregulation in some countries led to new market-based mechanisms as an alternative to feed-in tariffs; for example, Australia's pioneering REC system introduced in 2000 and the UK's ROC system. Some commentators anticipated that these systems together with a federal RPS in the US, would challenge feed-in tariffs as the predominant support mechanism.

As it turns out, the first decade of the millennium has seen great success for the renewables industry.

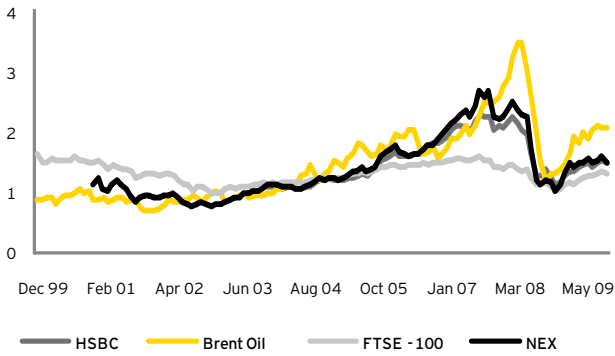
Total installed wind capacity at the end of 2009 was 158GW, up from around 13GW 10 years earlier. Meanwhile, total solar capacity grew from less than 1GW to 20GW: representing compound annual growth rates of 28% and 35% respectively. In 2000, Ernst and Young (in a report for the DTI) suggested that cumulative capital spend in the sector could be as much as US\$300b (€209.1m) to 2010; although perceived as optimistic at the time this total has been exceeded by US\$100b (€69.7m) to US\$200b (€139.4m) according to various sources of industry to date.

During this time, the industry has become increasingly globalized, with large-scale players emerging, such as Iberdrola which now has in excess of 10GW of wind capacity, i.e., more than 50% of the world's total capacity in 2000.

In Europe and some other territories, additions to renewable capacity (mainly wind) now routinely exceed those for conventional technologies.

There have been challenges on the way: the German market dealing with the withdrawal of tax-based KG finance structures; the US responding to further delays in PTC/ITC renewal around some presidential election years; Spain reacting to changes in its support mechanism for PV; and most recently, the industry as a whole coping with the impact of the credit crunch on project and corporate finance.

Relative changes over the last decade for HSBC Climate Change, Brent crude oil, FTSE-100, and Wilderhill indices



Source: Ernst & Young

While those contemplating the gradual decline of the feed-in tariff system have found that reports of its death were premature.

In Australia, for political reasons the REC system has not really taken off, while in the UK, the ROC system has improved delivery to a degree but never really caught up the ground lost in the 1990s, partly due to planning delays and grid connection issues. Thus, at the end of the decade, the wide-scale adoption of the feed-in tariff mechanism rather than market-based mechanisms has been a worldwide trend, with France, China, India (with solar) and Ontario now following the feed-in tariff route. In the US, the ability to swap tax credits for 30% treasury grants (as part of the

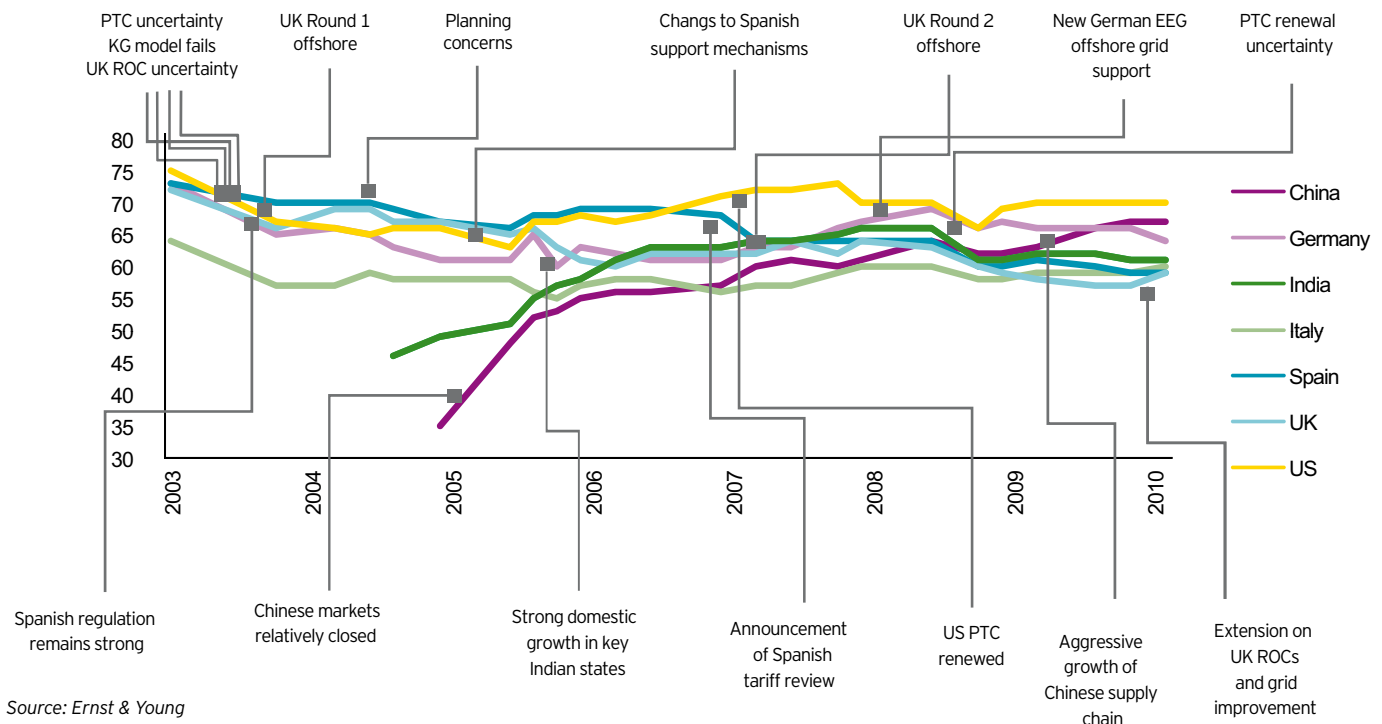
American Recovery and Reinvestment Act) provides an even stronger known return incentive.

Even in the UK, a feed-in tariff is shortly to be introduced for sub 5MW projects and Ofgem (the UK regulator) has implied that the remaining ROC system may need to be replaced as part of a wider overhaul of electricity market mechanisms – perhaps with capacity tenders.

Just as the move towards economic ascendancy in emerging (or rather new) markets has been the biggest economic story of the decade, the growth of renewables manufacturing and installed capacity in China (and to a lesser extent India) has been the most significant event in the renewables industry.

In 2009, more wind capacity was installed in China than anywhere else, and China announced a huge domestic solar program having previously focused on exports. China now makes most of the world's PV panels and Chinese wind turbine manufacturers now appear in the world's top 10 (although not yet as significant exporters). The speed with which this has been accomplished was not widely anticipated. At the beginning of 2000, UK wind capacity was about 360MW whereas that in China was only 260MW, while at the end of 2009, installed capacity in the UK was just over 4GW and that in China more than 25GW. The Ernst & Young all renewables index which commenced in 2003 with coverage of 15 countries, now expanded to 27, first included China in December 2004 at rank 19 out of 20 - it is now ranked 2 (behind the US) with only market access issues preventing it from being top of the index.

All renewables index score change since 2003 for selected countries



Source: Ernst & Young

On the technology front, there has been steady progress in wind and solar: the average size of wind turbines has greatly increased bringing down costs per kWh of electricity generated, and the solar industry has delivered major cost savings.

But in both cases, the cost curve has not been as relentlessly downward as originally anticipated: towards the end of the decade, supply chain shortages and rising steel and copper costs led to strong upward pressures. More recently, the drop in demand from the credit crunch has re-introduced the downwards cost trend – most markedly in the case of solar. As demand increases again, raw material-led price inflation may well affect wind in particular and supply chain pressures could re-emerge – possibly tempered by the extent to which China, India and Korea focus on export markets.

From an investor’s perspective, there are already signs that this should be the decade when concentrated solar and thin film installations vie successfully with conventional PV and when the geothermal industry enjoys a resurgence (possibly competing with clean coal for access to aquifers).

Conventional onshore wind may also see new improved technologies being deployed which focus on greater load factors through improved design (and reliability) rather than just increasing the swept area of the blade. There could also be a renewed market for sub 2.5MW, possibly sub 1.5MW, community-sponsored wind turbines.

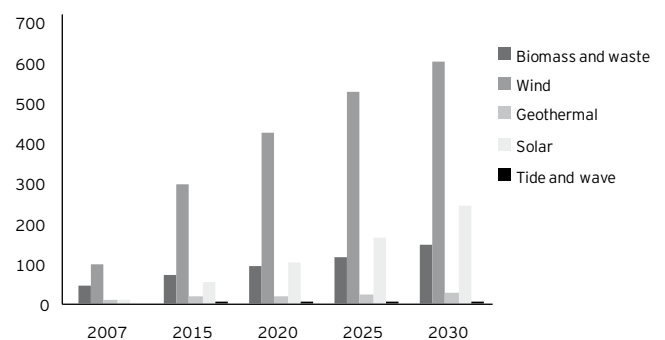
Offshore wind still has many challenges but it is now building significant momentum in the UK and Germany in particular, with 5MW to 10MW turbines likely to become the norm. In the UK there are still concerns over the delivery of the required grid infrastructure, and the ROC system to date has needed periodic renewals of enhanced levels to provide sufficient investor returns; a process that is likely to need repeating to make a success of the recently awarded third round licenses.

It is perhaps inevitable that not all technologies have progressed at the speed many would have liked and in some cases the message has been that ambitious technological change in the industry takes time to deliver: with the movement from prototype through to demonstration and thence to commercialization proving challenging. In some cases technological progression has been held up by regulatory policies that do not move at an appropriate and complementary pace. Unfortunately, some of these lessons appear to be learned many times over. For example, the wave and tidal industry on the whole has not received the scale of support it needs to achieve breakthrough.

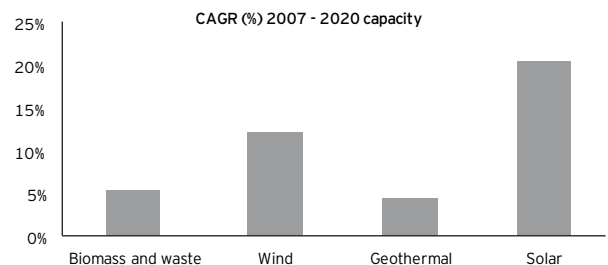
The coming decade should be one in which conventional biomass with carefully sourced feedstocks (and ideally combined with renewable heat offtake to improve efficiencies) delivers significant capacity to many countries’ networks. The new biomass technologies (such as pyrolysis, gasification and

anaerobic digestion) should become more proven from a financing perspective, allowing the biomass component of waste streams to enter the energy equation. However, many in the financial community state that these technologies tend to be underperforming relative to their initial business plans – sadly a symptom of many newly deployed technologies.

### Cumulative installed capacity (GW)



### Compound Annual Growth Rate (%)



Source: IEA 2009 Reference Scenario and Ernst & Young analysis

When this is combined with the need to replace ageing nuclear and fossil fuel fleets, the next decade may well end with power outages being relatively commonplace, perhaps dressed up in the form of demand restriction agreements with heavy energy users: a prospect confirmed by a recently published report by the UK’s Ofgem, but also a risk for some other mature energy markets.

The renewable electricity industry is also likely to end the decade as part of a broader renewable energy and energy efficiency industry – encompassing transport and heat with many linkages to the waste industry (as it provides feedstock that may otherwise be landfilled producing carbon emissions). It will be interesting to see the extent to which large utilities and specialist players address the market across this broader spectrum rather than concentrating on what will be one sub-sector alone. New business models and new players could well emerge, particularly in the

provision of renewable electricity, heat and energy efficiency measures to the built environment.

The significance of this change is that there will be further competition for incentive monies especially as economies emerge from the recession. Governments which in the past have used support mechanisms to grow renewable capacity are more likely, where markets are established, to use the mechanisms as a means of driving down costs and reducing consumption. Just as Spain and more recently Germany have done in the solar PV market to the shock of established manufacturers.

In the next decade, value for money in terms of cash impact on taxpayers and consumers and in terms of cost per carbon tonne saved are likely to be paramount, together with the impact on low carbon industrial strategy. The measures required to drive through investment are likely to lead to rising energy costs, putting pressure on the rollout of renewable solutions to the fuel poor. Renewables and energy efficiency may well be the weapons of choice in dealing with the carbon agenda but the consumer and the taxpayer are unlikely to be willing to sign a blank check. The industry needs to prepare itself to deliver value in the long term.

In 2000, the hope was that at the end of the decade mature renewable technologies would be much closer to "grid parity." The challenge the industry faces now is that by 2020 this may well be an essential requirement. Of course, it is conceivable that at some future climate change summit much more ambitious targets to 2050 become accepted and that a new norm emerges. Renewables could take up such a significant proportion of generating capacity that they themselves define the grid parity price and are used as a reference point for competing but similarly expensive technologies such as nuclear and clean coal, with gas the only cheaper alternative used as a flexible reserve.

More fundamentally, the renewable electricity industry is likely to become a core part of most energy economies – creating challenges to current base load models. Electrification of transport may well produce demands for additional generation capacity (whether conventional or renewable) that are in excess of what build programs can deliver.

By 2020 onwards, there should be the prospect of tens of thousands of megawatts of offshore wind and hopefully wave capacity, with a more broadly developed onshore renewables sector and tidal schemes. In addition, a significant proportion of waste should be diverted to energy. In desert areas such as North Africa, "hyper solar projects" could well emerge exporting power to Europe – if efficiencies can be improved in the dust prone environment.

One thing is clear, all technologies (including non-renewable technologies) pose significant challenges and the days of "cheap and easy" energy are gone.

In the 2020s we should be incorporating heat pumps and solar PV as a matter of routine in the built environment, combined through smart grids with aggressive demand management.

As has been the experience to date, there will be "optimism bias," regarding the costs and time taken for grid infrastructure investment, both national and transnational. The availability of the immense sums of capital required for the sector to develop freely may also be being incorrectly presumed. From the current post credit crunch standpoint, without further reforms, the capital flows required are in all probability too much for even the largest utility to bear and many governments are severely financially constrained.

In individual countries, new techniques and institutions are likely to be needed to raise the sums required without stretching state finances – possibly involving the use of green and tax-exempt bond structures to provide a direct channel for savings and pension funds matched to long-term projects. Sovereign wealth funds and investors from new markets such as China and India could well emerge as significant players in the West's energy industry, based on financial strength derived from their home markets.

For the renewables industry as a whole, growth levels of at least 15% to 20% are likely to be the norm. Some existing markets are likely to grow very strongly (such as Brazil), while further new markets are likely to emerge – perhaps not in such a spectacular fashion as in China but significant nonetheless – and these may well include South Korea, Taiwan, Mexico, Chile, Egypt, Morocco, and various Eastern European countries and perhaps a 'wildcard': Russia.

Whatever the outcome, one thing is certain: competition for new green jobs. The coming decade is probably the defining moment for a new broader renewable energy (and efficiency) industry and the economic activity it provides. For economies left behind, the danger is that dependence on increasingly expensive fossil fuels is replaced by dependence on imported low carbon technologies, with consequently lower returns for the colossal levels of investment nevertheless required to de-carbonize an economy.

# Issue highlights

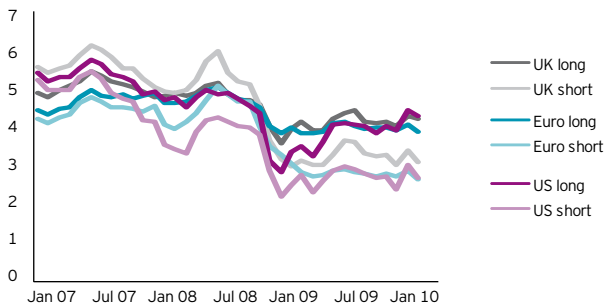
## Debt markets

### Where is all the money coming from?

The UK energy market alone is expected to require in the region of £200bn of investment over the next decade, covering new conventional, nuclear and renewable generation. At a time when the capital markets are extremely squeezed, and will probably remain so for the foreseeable future, access to capital will probably represent the single biggest challenge for the renewable energy sector.

Infrastructure has the single biggest appetite for new capital. Project finance will certainly have a significant role to play, however the economic downturn, and in particular the credit crisis, have led to project financiers retreating to their domestic markets, and their preferred relationships. Where there is appetite to lend, holding volumes of individual banks rarely exceed €50m, making larger deals more difficult to fund.

### US, UK and Euro long- and short-term swap rates from January 2007 to January 2010



Source: Bloomberg

A recent survey of lenders to the renewable energy sector suggest the situation is improving; the general themes being that larger hold volumes are increasingly possible, and the return of underwriting to support larger deals might be imminent. However, project finance will always gravitate towards the most 'vanilla' of infrastructure assets, with the least underlying risk. Accordingly, the energy sector in general, and within that the renewables sector, will have to continue to compete for scarce capital alongside other infrastructure sectors.

Less established renewable energy markets are feeling the full impact of lenders retreating to their domestic markets. There is some appetite to lend into markets such as Central and Eastern Europe and Africa, however the presence and support of multi-laterals and strong sponsors has never been more important.

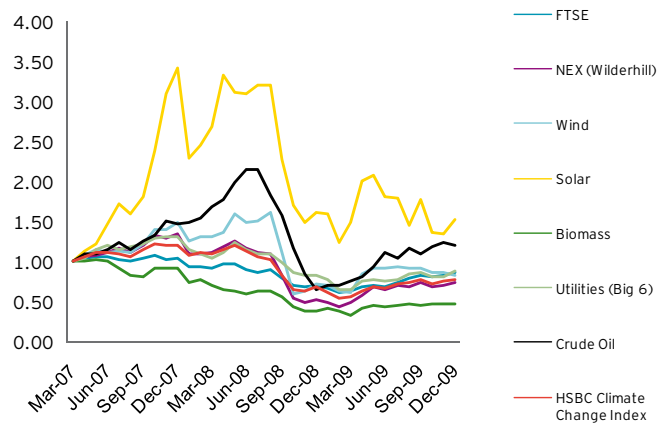
Given the scale of investment needed in new infrastructure, better use will need to be made of the public markets (both debt and equity finance), and the secondary markets will also have an increasingly important role to play in purchasing and owning long-term assets.

## Equity markets

### Renewable energy and indices performance from March 2007 to September 2009

Recent movements in equity suggest the wider market is continuing to recover from February 2009's low point. Renewable energy industry companies echoed a similar trend to the general market place and followed a fairly level pattern in latter half of 2009. The trends in the wind and solar sector; however, show slight decreases in the last quarter, despite broadly mirroring the wider market recovery experienced during the previous months. The biomass sector appears to remain consistent with the previous quarter's performance. Renewable energy industry companies continue to echo a similar trend to the general marketplace and are following a fairly level pattern in the latter half of the year.

### Weighted averages



Source: Ernst & Young

## M&A activity in the renewables sector

### Wind

BKW FMB Energie AG, the listed Switzerland-based company engaged in the production, transmission, distribution and sale of electricity, has agreed to acquire Volturino Wind Srl, the Italy-based operator of wind power plants. The acquisition is in line with BKW's strategy to set up a further wind farm in Volturino by the end of 2011.

GDF Suez SA, the listed France-based natural gas and electricity supplier, has agreed to acquire DLF Wind Power Private Limited, the India-based wind power business, from DLF Limited, the listed India-based real estate development company.

NRG Energy Inc, the US listed wholesale power generation company, has acquired Bluewater Wind LLC, the US-based developer of wind energy projects, from Babcock & Brown Ltd and Arcadia Windpower Holding LLC, for an undisclosed cash consideration, estimated around US\$10m (€14.3m). The transaction will enable Bluewater Wind to enhance its development expertise, as well as access to capital for the development and construction of its projects.

NIBC European Infrastructure Fund I C.V., a pan-European infrastructure fund based in the Netherlands, has acquired eight German wind farms, with total capacity of 82MW, from Viridis for consideration €72.2m.

Bord Gáis has acquired SWS Natural Resources, one of the largest wind generators in Ireland operating 179MW of wind generating capacity, for total consideration of US\$754.5m (€525.9m). The acquisition is part of Bord Gáis' strategy to enhance its renewable energy portfolio.

### Hydro

Fort Chicago Energy Partners LP, an owner and operator of energy infrastructure assets, has agreed to acquire Northbrook New York LLC, the US-based operator of a hydro power generation facility, for a consideration of US\$80m (€55.8m).

### Geothermal

Ormat Nevada Inc, the US-based geothermal energy provider and a wholly owned subsidiary of Ormat Technologies Inc, the US-based Israeli-listed company, has acquired a 30% stake in OPC LLC, the US-based geothermal energy provider, from Lehman OPC LLC, an affiliate of Lehman Brothers Holdings Inc, for a consideration of US\$18.5m (€12.9m).

### Solar

An investment consortium consisting of Good Energies Investments AG, New Energies Invest AG, the Switzerland-based private equity firms, Masdar, the United Arab Emirates-based holding company of clean energy-related businesses, and Zouk Ventures Ltd, the UK-based venture capital firm, has agreed to acquire a majority stake in Enviromena Power Systems, the United Arab Emirates-based developer of solar projects in Middle East and North Africa, for a consideration of US\$15m (€10.5m).

Bergamo Acquisition Corp, the listed US-based brand management company engaged in the clothing industry, recycle and energy sector, has agreed to acquire a minimum of 60% stake in Suntrough Energy Inc, the US-based solar energy company, for an estimated equity consideration of US\$50m (€34.8m).

New Energies Fund, the Portugal-based fund managed by Banif Bank, the listed Portugal-based commercial bank, has acquired MARL Energia SGPS SA, the Portugal-based company that develops and manages urban solar PV infrastructure in Europe, for an undisclosed consideration.

Fomentinvest SGPS SA, the Portugal-based investment holding company, has acquired 40% stake in MARL Energia SGPS SA, a developer and manager of urban solar PV infrastructure, for a consideration of €11.4m.

NRG Solar LLC, the US-based company engaged in the electricity generation business, a subsidiary of NRG Energy Inc, the listed US-based power generation company, has acquired Blythe Solar Project, the US-based solar power project of First Solar Inc, the listed US-based manufacturer of solar modules.

Anemoi Renovables S.L., a Spanish renewable energy development company funded by Platina's Mistral Energy II fund in a 50:50 joint ownership structure with Platina's European Renewable Energy Fund (EREF), has acquired the Arico solar project in Tenerife from Endesa.

### Biomass

Viessmann Group, the family-owned German heating systems company, has submitted a binding bid to take over most of the assets of insolvent Schmack Biogas, a leading German supplier of biogas plants.

# All renewables index at February 2010

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

Source: Ernst & Young

1. Ranking in issue 23 is shown in parenthesis.

2. Combines with each set of technology factors to produce the individual technology indices.

3. This indicates US states with Renewable Portfolio Standards (RPS) and favorable renewable energy regimes.

This issue sees Germany falling two points following news that solar PV may face tariff cuts in excess of the annual depression. There has been political debate in relation to the appropriateness of supporting PV despite relatively low sun irradiation. A list of the tariff reductions can be viewed within the Germany country focus on page 14.

The UK has risen two points to tie with Spain at joint fifth place, on the back of several positive events; including DECC's extension of the Renewables Obligation Scheme until 2037 and its 20-year support for new projects effective from April 2010. January 2010 also saw the Crown Estate granting development licenses for each of the nine Round III zones totalling 32GW of offshore wind capacity. DECC also announced index-linked feed-in tariffs supporting a range of smaller scale (up to 5MW) renewable investments.

Australia has climbed a point in the all renewables index to tie with Ireland and Greece, following the announcement from South Australia to step up renewables targets to 33% by 2020, while introducing tax incentives in place for the next four years.

The Netherlands saw a three point climb, rising above Poland, owing strongly to the successful introduction of a near-shore tariff following lobbying by owners of a near-shore wind farm in November 2009, see page 17 for details. This sets a precedent and will likely attract future development to the sector. The government also budgeted €5.3 billion to support plans for a tender for offshore tariffs in 2010 to stimulate the rollout of offshore wind projects. The EIB also provided €300m of funding for a Netherlands-UK interconnector project.

# Wind indices at February 2010

Rank <sup>1</sup>		Country	Wind index	Onshore wind	Offshore wind	Near-term wind
1	(1)	China	72	75	62	80
2	(2)	US <sup>2</sup>	71	75	58	85
3	(3)	Germany	66	64	69	50
4	(5)	UK	65	63	73	52
5	(4)	India	62	70	41	56
6	(6)	Spain	60	65	45	50
6	(6)	Canada	60	65	46	46
6	(8)	Italy	60	63	52	47
9	(8)	France	59	60	55	47
10	(10)	Ireland	58	58	58	40
11	(16)	Netherlands	54	52	58	37
11	(11)	Portugal	54	59	42	39
13	(12)	Greece	53	57	42	40
14	(13)	Sweden	52	52	53	35
15	(14)	Australia	51	54	41	40
16	(15)	Belgium	50	48	56	37
16	(16)	Poland	50	53	41	39
18	(18)	Norway	48	49	44	34
19	(18)	Denmark	47	44	56	34
20	(20)	New Zealand	46	50	35	32
21	(21)	Japan	45	47	38	27
22	(21)	Brazil	44	48	33	36
23	(23)	Turkey	42	45	35	32
23	(23)	South Africa	42	46	34	32
25	(25)	Czech	34	46		28
26	(26)	Finland	33	33	34	23
27	(27)	Austria	29	40		24

Source: Ernst & Young

1. Ranking in issue 23 long-term wind index is shown in parenthesis.

2. This indicates US states with RPS and favorable renewable energy regimes.

At the top of the table, there is no significant movement on an overall level as scores for China and the US place them consistently in first and second position respectively. In the onshore index, China has fallen a point due to the UN's withdrawal of CDM status of 10 of its wind farms which has a knock-on effect on investor confidence.

Germany has dropped a point in the wind index due to the annual regression of feed-in tariffs in 2010 which, while expected, is likely to affect returns and decrease attractiveness of investment.

The UK has climbed three points to overtake India in the wind index on the back an extension to the government's Renewables Obligation Scheme up to 2037. Included in this amendment is the extension of the support for offshore wind projects that continue to be granted two ROCs per MWh up to 31 March 2014.

The UK Crown Estate's announcement of development licenses for 32GW of offshore wind capacity moves the development of significant amounts of UK offshore wind power closer.

Italy has risen by a point to tie with Spain and Canada due to its strong green certificate mechanism, particularly for offshore wind.

The Netherlands has also ascended five points to tie with Portugal, following the announcement of the new 2010 SDE which includes a near-shore tariff, see page 17 for details. The government also reserved a €5.3 billion budget to be awarded as offshore wind tariffs based on a tender procedure. Both events serve to bolster investor confidence and attract more investment into the sector.

# Near-term wind index at February 2010

Rank <sup>1</sup>	Country	Wind index
1 (1)	US <sup>2</sup>	85
2 (2)	China	80
3 (3)	India	56
4 (6)	UK	52
5 (4)	Germany	50
5 (5)	Spain	50
7 (7)	Italy	47
7 (7)	France	47
9 (9)	Canada	46
10 (11)	Greece	40
10 (11)	Australia	40
10 (11)	Ireland	40
13 (14)	Poland	39
13 (10)	Portugal	39
15 (18)	Netherlands	37
15 (14)	Belgium	37
17 (16)	Brazil	36
18 (17)	Sweden	35
19 (18)	Denmark	34
19 (18)	Norway	34
21 (22)	South Africa	32
21 (21)	Turkey	32
21 (22)	New Zealand	32
24 (24)	Czech	28
25 (25)	Japan	27
26 (26)	Austria	24
27 (27)	Finland	23

Source: Ernst & Young

1. Ranking in issue 23 (August 2009) is in brackets.

2. This indicates US states with renewable portfolio standards (RPS) and favorable renewable energy regimes.

## Near-term wind index

China's score dropped a point following the UN's suspension of CDM financing for 10 of its wind farms. This has caused a knock-on effect on investors' views of continued CDM support for near-term projects within the Chinese wind sector.

The UK climbed three points, rising above India, Germany and Spain, mainly on the back of the Round III's 32GW offshore development licensing awards, coupled with the government's extended support for the Renewables Obligation Scheme. The application period of the two ROCs /MWh offshore band has been extended as has the period over which ROCs will be supported, for more details see the wind indices section on page 10.

Germany fell two points to tie with Spain due to the annual digression of the feed-in tariffs at the start of 2010, decreasing power off-take attractiveness for the wind sector in the near term.

The Netherlands has risen three points to tie with Belgium, following the announcement of the new 2010 SDE which includes a near-shore tariff, see page 17 for details To stimulate the expansion of offshore wind projects in 2010, the government also budgeted €5.3 billion for subsidizing approximately 950MW of new capacity additions. The subsidy will be awarded based on a tender procedure where qualifying parties may apply for an SDE top-up subsidy up to a maximum of €0.181/kWh.

Poland climbed two points, reflecting greater market forecast capacity approaching the two-year near-term horizon.

Portugal has fallen three points to tie with Poland, in light of the revised position of its tariff relative to other incentives available.

Turkey has fallen a point following renewable energy legislation stalls in the Turkish parliament, delaying a new draft law offering more generous incentives.



# Country focus – US

## Tax credit or grant

Ranking	Issue 24	Issue 23
All renewables index	1	1
Long-term wind index	2	2
Near-term wind index	1	1

Source: Ernst & Young

Republican Scott Brown's victory in January 2010's special election for the US senate seat formerly held by liberal Democrat Ted Kennedy, has stripped Democrats of the 60-seat Senate supermajority needed to limit the impact of filibusters. With this lost, it is likely that bills passing the senate may take considerably longer; one of the areas likely affected will be climate change legislation.

The 2011 US Budget announced in February 2010 promises the following RE highlights:

- ▶ Department of Energy – Double renewable energy generating capacity (excluding conventional hydropower) by 2012.
- ▶ Department of the Interior – Develop renewable energy production by increasing the approved capacity for production of renewable (solar, wind, and geothermal) energy resources on Department of the Interior managed lands, while ensuring full environmental review, by at least 9,000MW to 2011.
- ▶ Renewable energy usage increase – All federal agencies will increase their use of electricity from renewable sources from 3% in 2008 to 7.5% by 2013 and at least half of that will come from (new) sources placed in service after 1999.

Business and Rural Development Credit Programs -US\$4.1b (€2.9b) budgeted as loans for distribution, construction of renewable energy facilities, transmission, and carbon capture projects on facilities that use fossil fuel.

A senator from California has introduced legislation that would extend by two years the Treasury grants program which allows RE developers to opt for grants from the Treasury department in lieu of tax credits. This program was established under the economic stimulus package in early 2009 to address the lack of tax equity financing for renewable projects. Under the proposed legislation, the program would be extended to cover projects beginning construction in 2011 and 2012 compared with the present 2009 and 2010 time frame. This will likely provide medium-term certainty for major developers to begin making new turbine orders for delivery in 2011/2012.

New York-based GE announced on 10 December 2009 that it has received a US\$1.4b (€975.8m) contract from independent power producer Caithness Energy to supply wind turbines and provide services for a 845MW wind farm project, planned for construction in the US state of Oregon. A total of 338 turbines will be installed in 2011 and 2012. GE Energy Financial Services, with a portfolio of more than 40 wind farms with a combined wind power capacity of more than 6GW, is investing in the project.

New York is formally looking for developers to build one or more offshore wind farms in the Great Lakes – namely Lake Erie or Lake Ontario. According to the state's Request for Proposals, the individual projects could generate 120MW to 500MW each and must be on line by 2015. The state-owned New York Power Authority (NYPA) said it would purchase the power generated. Authorities have estimated the projects could cost as much as US\$1b (€697m) each. A quarter of the state's electricity must come from renewables by 2013. Proposals are due by 1 June 2010, but the state should have been informed of a developer's interest by 20 March 2010.

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# Country focus – China

## Tender and feed-in tariff

Ranking	Issue 24	Issue 23
All renewables index	2	2
Long-term wind index	1	1
Near-term wind index	2	2

Source: Ernst & Young

China has amended its renewable energy law in efforts to increase the purchase of clean power. The amendment, effective from 1 April 2010, calls for greater enforceability over 2006's renewable energy law for the compulsory purchase of RE power by grid companies, through a proper monitoring system and clear responsibilities for grid companies.

The amendment mandates the state energy councils and regulators to supervise green power purchases by grid companies, imposing heavy fines if these grid companies refuse to purchase electricity from renewable sources. These fines could be as much as double the economic loss of the RE companies.

The amendment also requires the government to set up a new national renewable energy development fund. This fund will finance scientific research, develop rural clean energy projects, construct independent power systems in remote areas and islands, build information networks to exploit and evaluate RE and increase the localized production and development of renewable energy equipment. This in turn should provide more certainty for foreign developers looking to invest in the renewables sector in China.

According to the National Development and Reform Commission, China spent approximately CNY3b (€306m) subsidizing 281 RE projects from January to June 2009, a 50% increase compared to CNY2b (€204m) subsidy granted for 222 projects in the 6 months ending December 2009. Wind projects took the majority (80%) of the total subsidy.

In December 2009, the UN suspended CDM status for 10 Chinese wind farms. To qualify for CDM status, a project must demonstrate "additionality" - improved carbon offset which would not occur without CDM status. It was argued that the projects in question would be built regardless of CDM involvement, and as such did not offer additionality. Developers active in China questioned the decision, stating it put at risk up to 200 Chinese wind power projects that are currently in the pipeline and have CDM status, and could threaten investment not just in wind energy but also in hydropower and other forms of clean energy.

The Environment Industry Fund, China's first fund to support environmental technologies, including renewable energy, has been created by a state-run Chinese company, China General Technology Group. The fund is expected to raise CNY2b (€204m) in its first phase. The money will be invested in renewable energy as well as the water industry, solid waste disposal, energy conservation and carbon emissions cuts.

As part of its Golden Sun pilot program, the Chinese government has selected 294 PV projects with a total capacity of 642MW. Of the projects, 35 projects (totalling 306MW) are utility-scale PV projects, while 27 independent projects totalling 46MW will be built in remote regions, supplying more than 300,000 households. The remaining 232 projects (290MW) will be built by major industrial and commercial firms for own power consumption. The government also released specific prices and quality requirements for parts and components of the qualified projects.

ESolar, a California-based solar thermal electricity generation technology developer, has signed a licensing deal with Chinese manufacturer Penglai Electric for at least 2GW of projects in western China. Construction will be lead by China Huadian Engineering Company with the first 92MW plant based on ESolar's 46MW generation module. The projects will be developed through to 2021 and will be designed to incorporate co-firing with biomass, allowing operation beyond sunny hours without adding thermal energy storage. The technology could serve as a baseload provider in a region which has giga watts of planned PV and wind projects with intermittent power generation.

Chinese wind turbine manufacturer Goldwind signed two separate contracts worth CNY1.1b (€112.3m) to supply its 1.5MW turbines to Sinohydro and Hydrochina. Goldwind will provide 109.5MW of Sinohydro's 200MW Guazhou Ganhekou No. 4 wind farm in the Gansu province. For Hydrochina, 101MW of turbines will be provided by Goldwind at its Guazhou Beidaqiao No.1 wind farm, which is also in Gansu. Chinese turbine manufacture Sinovel will provide the remaining turbines required for both projects.

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# Country focus – Germany

## Feed-in tariff

Ranking	Issue 24	Issue 23
All renewables index	3	2
Long-term wind index	3	3
Near-term wind index	5	4

Source: Ernst & Young

## New feed-in tariffs

### General

Investments into German renewable energy projects are driven by the feed-in tariff scheme. The start of the new year sees the degression of the prior year's tariffs as set out below.

Special stipulations for solar PV

For solar PV, additional reductions will come into force from 1 April 2010 onwards.

- ▶ 15% additional reduction for roof top plants and ground mounted plants
- ▶ An additional 10%, i.e., 25% on ground mounted plants using arable farmland, to become effective from 1 July 2010 onwards

These reductions come as the result of a political debate about the appropriateness of supporting PV despite comparably low sun irradiation, as well as concerns from the new government about loss of arable land to PV developments.

Feed-in tariffs in ct/kWh	2009		2010	
	Initial tariff	Basic tariff	Initial tariff	Basic tariff
Offshore wind	16.50	3.50	16.50	3.50
Onshore wind	14.22	5.02	14.08	4.97
Biomass - for the first 150kW output	n/a	11.67	n/a	11.55
Biomass - for 150kW - 500kW output	n/a	9.18	n/a	9.09
Biomass - for 500kW - 5MW output	n/a	8.25	n/a	8.17
Biomass - for 5MW - 20MW output	n/a	7.79	n/a	7.71
Solar PV - ground mounted	n/a	31.94	n/a	28.75
Roof top PV with capacity over 1MW output	n/a	33.00	n/a	29.70

## Offshore wind

### Market 2009

As reported in the last CAI issue Alpha Ventus' 15 offshore wind turbines are now operational. Alongside three test turbines, these bring Germany's operational capacity to 72MW.

### BARD 1 Offshore

After 26 months of construction, the grid operator Transpower, has finalized the €400m BorWin 1 offshore substation. The 'BARD Offshore 1' wind farm will be constructed around 100km off the German coast. With a length of 180km (100km of offshore and 80km of onshore cabling), this is the longest offshore grid connection to date. The BARD wind farm will consist of 80 5MW wind turbines. However, construction is reportedly slightly behind schedule.

## Onshore wind

### Market 2009

In recent years, the German wind turbine market has been dominated by Enercon's direct drive turbines. In 2009, these turbines represented 60% of the 1.9GW installed. Schuler Group has announced their entry to this market with a 2.7MW direct drive, medium windspeed onshore turbine. A prototype is expected in Autumn 2010 with full production in 2013.

### Transaction market 2010

There has recently been a rise in interest in transactions within the onshore wind market, specifically surrounding larger portfolios. Many of these transactions are still in early stages or are not currently closed and it has yet to be seen whether this initial trend will continue through the year. One possible driver of this trend may be the fragmented nature of the German onshore market. The research company Emerging Energy Research, suggested in May 2009, that International Power has a stake of 2.4% of the total installed basis, which is considered as the biggest stake in the market.

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# Country focus – UK

## Tender and grid capacity

Ranking	Issue 24	Issue 23
All renewables index	6	7 <sup>1</sup>
Long-term wind index	4	5
Near-term wind index	3	6

Source: Ernst & Young  
1. Joint

This issue saw the announcement of proposals to invest up to £1b (€1.1b) to improve electrical infrastructure over the next two years. The proposals, announced by Ofgem, will help renewable energy projects gain connection to the grid. Approximately 90% of the investment will be designated to Scotland to help unlock its onshore and offshore energy potential. This will include the upgrade of the Beaulieu-Denny line, an existing 137 mile transmission line, by Scottish & Southern Energy.

Furthermore, nine governments, including the UK, Germany, France, Belgium, the Netherlands, Luxembourg, Denmark, Sweden and Ireland, are involved in developing plans for Europe's first offshore electricity grid dedicated to renewable power. The high voltage direct network of undersea cables will link clean energy projects around the North Sea and will be an important step in achieving the European Union's target that 20% of its energy is to be from renewable sources by 2020.

In December, the European Commission pledged £267m (€300m) of grant monies to the UK to aid the development of renewable energy projects. These funds will be delivered through the European Energy Programme for Recovery (EEPR) fund. Of this, £164m (€185m) has been allocated to Powerfuel Ltd to develop a 900MW carbon capture and storage power plant; Scottish Hydro Electric Transmission will receive £67m (€75m) to build a high-voltage direct current hub in Scotland and Aberdeen Offshore Wind Farm Ltd will receive £36m (€40m) to construct a wind deployment center in Aberdeen for testing multi MW turbines.

DECC has announced the finalized version of the feed-in tariff (FiT) scheme, showing strengthened tariffs for wind, solar PV and hydro technologies. The scheme supports smaller-scale installations up to 5MW and will be effective from April 2010. Tariffs are to be index linked – linking payments to the retail price index in order to ensure the income from them is in line with inflation; rate of return will be between 5% to 8%, as originally proposed.

The FiT announcement comes as plans for a “world first” Renewable Heat Incentive (RHI) scheme was also unveiled by the DECC which will incentivize low carbon heating technologies of all scales. It will see producers of renewable heat rewarded per kWh of heat generated, similar to feed-in tariffs for small-scale generation. The RHI is set to be introduced in April 2011.

The Crown Estate announced the winning consortia for each of the nine Round III zones totalling 32GW of new offshore wind capacity. The successful bidders included utilities, developers and EPC firms with an existing offshore presence as well as new entrants. It is unlikely that many of the 6,000 turbines will be built in the UK, despite efforts by the government to persuade any of the major turbine manufacturers to open a factory in the UK.

Almost all of the manufacturing contracts for the London Array have been awarded overseas; only €180m of the €2b contracts have been awarded to domestic suppliers.

April 2009's Budget proposed that the EIB would provide up to 50% of the capital costs for onshore wind projects with a loan term of 15 years. In November, £1.4b (€1.6b) of funding was made available for the scheme supported by the Treasury and DECC. The EIB will provide £700m (€788m) over the next three years with the remainder matched by RBS, Lloyds Banking Group and BNP Paribas Fortis. The loans will be available to projects with costs of up to £100m (€113m).

The REA has reported that DECC has changed its position on baseline grandfathering of ROCs for biomass, Anaerobic Digestion (AD) and Energy from Waste (EfW). DECC states that no baseline grandfathering exists for these technologies, therefore at the next ROC banding review, if the ROCs /MWh for these technologies were to change, all existing projects would move on to the new banding. Baseline grandfathering is considered essential to obtain project finance and DECC's position is preventing projects from reaching financial close. The REA are in the process of holding discussions with the government to identify an appropriate course of action.

The government has closed its Low Carbon Buildings Programme Phase 2 to solar applications due to unprecedented demand. The £50m (€56m) scheme had included up to £18m (€20m) for public sector buildings to install PV panels on their roofs.

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# Country focus – France

## Feed-in tariff

Ranking	Issue 24	Issue 23
All renewables index	8	7 <sup>1</sup>
Long-term wind index	9	8 <sup>1</sup>
Near-term wind index	7 <sup>1</sup>	7 <sup>1</sup>

Source: Ernst & Young  
1. Joint

In January 2010, the Ministry for the Environment, Energy, Sustainable Development and the Sea (MEEDDM) published its new order which sets out a relatively complex PV tariff structure that, in some respects, is a little more restrictive than the market expected.

### 1. The new feed-in tariff scheme

The Order's new tariff is structured around three main tariff categories, as follows:

- ▶ Integrated building tariff – tariffs based on building use:
  - 58 c€/kWh for plants located on a building used mainly for residential, health or educational purposes
  - 50 c€/kWh for those plants located on other categories of buildings (e.g., office, industrial, tertiary, commercial or storage buildings)
- ▶ Simplified integrated tariff – 42 c€/kWh tariff: compliance with conditions connected to building use is not required.
- ▶ Basic tariff (for plants which the above do not apply) – varies from 31.4-40 c€/kWh depending on certain criteria and location.

The tariff applicable is determined based on the date the connection to the public grid is applied for by the producer (and not the date of PPA application anymore).

### 2. Clarified eligibility criteria

A plant is eligible for the 58 c€/kWh or 50c€/kWh tariff if it is installed on a building that is fully enclosed and covered, and at least 2 years after building completion (save for residential buildings). Further, the PV system must constitute part of the surface of the roof and replace parts which ensure that the building is enclosed, covered and is watertight.

Therefore, besides residential health or educational purposes, and private buildings with a tertiary use (e.g. offices, supermarkets), or industrial buildings (hangars, warehouses), PV systems installed on buildings owned or run by public entities are also eligible for the "integrated tariff" provided they satisfy the eligibility criteria. On the other hand, structures that are closed on three sides only (e.g. certain agricultural warehouses or hangars) and, a fortiori, those open to the elements (e.g. shelters and canopied structures), should be de facto excluded from the 58 or 50c€/kWh tariff.

Installations eligible for the 42 c€/kWh tariff require the PV system to be installed parallel to the gradient of the roof, replacing those parts of the building to ensure that the building is enclosed, covered and watertight, and that the peak capacity of the installation is more than 3 kWp.

The appendix to the Order provides for certain exceptions to the above criteria.

### 3. Capped purchase volumes

The Order stipulates an annual capped volume for power purchased depending on the type of solar PV plant, its peak capacity and location. The purchase tariff in excess of such capped volumes is 5 c€/kWh. This cap does not apply to solar concentration technology plants (i.e., CSP).

### 4. Indexation and a gradual reduction of 10%

Applicable tariffs will incur indexation each year according to a specific formula. The new tariffs will be maintained until 31 December 2011. For grid connection applications filed after that date, tariffs shall be indexed on 1 January of each year, by multiplying the value of the tariff for the preceding period by the coefficient (1-D) where D = 10%.

### 5. Term of the PPA

The term of the PPA remains at 20 years, beginning from the date when the installation is commissioned (i.e. connected to the public grid), which must be within 24 months of the producer filing his application for the grid connection.

### 6. Application in time

The new Order is effective as of 14 January 2010. This benefits new installations commissioned after this date that meet other stipulated conditions under French rules.

The previous 2006 Order continues to apply to PPA's still in force. A producer who has filed a PPA application based on the previous Order but has not commissioned before 14 January 2010, may file for a new PPA on the basis of the new Order.

Owing to a speculative bubble since November 2009, the Government announced in a February 17 press release, that certain projects with a capacity between 36kWp and 250 kWp which had not filed for a connection to the grid by 11 January 2010 would have to reapply based on the new tariffs, and that the 50/58 c€/kWh would be reserved to plants with a capacity less than 250 kWp. A further Order, including the above measures, is expected by the beginning of March 2010.

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# Country focus - Netherlands

## Feed-in tariff

Ranking	Issue 24	Issue 23
All renewables index	15	15 <sup>1</sup>
Long-term wind index	11 <sup>1</sup>	16 <sup>1</sup>
Near-term wind index	15 <sup>1</sup>	18 <sup>1</sup>

Source: Ernst & Young  
1. Joint

## Dutch sustainable energy incentive scheme

Renewable energy developments in the Netherlands are supported by the SDE incentive mechanism. The SDE system is a hybrid that provides a top-up subsidy per unit of output generated, to compensate for the difference between the SDE reference tariff and the actual gray spot price. As such, the mechanism differs from a feed-in tariff mechanism (e.g., Germany) or green certificate mechanism (e.g., the UK ROC system).

The 2010 SDE includes the following tariffs per technology:

Onshore wind:	€0.096/kWh
Offshore wind:	to be tendered
Solar PV:	€0.474/kWh (<15kW); €0.430/kWh (>15kW-100kW)
Biomass :	€0.114 - 0177/kWh

The SDE has not proved to be as popular as its predecessor the Milieukwaliteit Elektriciteitsproductie (MEP); according to the EWEA, only 39MW of new wind capacity was added in 2009. Key factors contributing to this are likely:

- ▶ The tariffs are set annually, therefore not necessarily providing the stability and certainty that investors need for their investment planning,
- ▶ The budget available for subsidies is set annually, further contributing to variability,
- ▶ No offshore tariff is provided.

Towards the end of 2009, the government has aimed to partly address these concerns by announcing two significant developments; the introduction of a near-shore wind tariff and an SDE tender for offshore wind, as follows:

## Near-shore tariff

In November 2009, the Dutch Ministry of Economic Affairs introduced a tariff for wind farms built on near-shore locations. Prior to this, so-called near-shore wind farms were treated as onshore locations. This change in policy followed an extensive dialog between the project principals of the largest planned wind farm in the Netherlands, project Noordoostpolder (NOP) and the Ministry of Economic Affairs.

As a result, NOP will receive an estimated subsidy of €880m over a 15-year period under the new tariff. The change in policy was needed to realize their planned 429MW project, which partly consists of a near-shore wind farm. The higher costs associated with constructing these near-shore projects required a specific SDE tariff to make them viable. This new tariff applies to wind turbines built in waters of a Dutch municipality, and have an installed capacity of 3MW to 5MW per turbine. Wind farms which match these criteria can receive subsidies on top of the spot price up to a maximum of €0.121/kWh.

The near-shore subsidized tariff will be effective for a period of 15 years with a maximum of 3,118 full load hours per annum. As for 2010, the near-shore tariff is not set as no SDE subsidy for near-shore projects has been requested.

## Support for offshore capacity development

In order to stimulate the rollout of offshore wind projects, the Ministry of Economic Affairs reserved a 2010 maximum budget of €5.3 billion for subsidizing approximately 950MW of new capacity additions. The subsidy will be awarded based on a tender procedure. Qualifying parties may apply for an SDE top-up subsidy up to a maximum of €0.181/kWh in the period from 4 January to 1 March 2010. Parties which request the lowest subsidy will be awarded eligibility first, up until the full budget is utilized. Parties will have to commit to realizing the project no later than five years after subsidy is awarded and will have to back this up by way of a bank guarantee.

In order to pre qualify for the tender procedures, interested parties had to obtain a permit for an offshore wind energy project. Twelve definitive permits have been granted to the following parties to date:

Permit holder	Wind farm	Proposed installed capacity	Distance to shore
Airtricity	Den Helder I	468 MW	63 km
Airtricity	Breeveertien II	349 MW	60 km
BARD Engineering	BARD Offshore NL1	300 MW	56 km
Global WindSupport	GWS Offshore NL 1	300 MW	56 km
RWE	Tromp Binnen	295 MW	75 km
Brown Ridge Oost	Brown Ridge Oost	282 MW	74 km
Nuon	Beaufort	279 MW	24 km
Eolic Power	EP Offshore NL 1	275 MW	56 km
Airtricity	West Rijn	259 MW	37 km
Evelop	Scheveningen Buiten	212 MW	28 km
Eneco	Q10	153 MW	23 km
Q4-WP	Q4-WP	78 MW	24 km

As a next step towards achieving the Dutch government's goal of 6GW of operational offshore capacity by 2020, the Dutch government intends to tender concessions for an additional 5GW. Legislation on this is expected in 2010.

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# Country focus – Ireland

## Feed-in tariff

Ranking	Issue 24	Issue 23
All renewables index	11 <sup>1</sup>	12
Long-term wind index	10	10
Near-term wind index	10 <sup>1</sup>	11 <sup>1</sup>

Source: Ernst & Young  
1. Joint

In December 2009, the Energy Council in Brussels announced that ministers from nine EU countries including Ireland signed a joint statement on developing a super grid network for offshore wind turbines in the North Sea. The grid will be the first of its kind and is designed to allow countries investing heavily in offshore wind energy projects to transfer energy easily between the grids of participating countries. The political declaration has been signed by ministers from Belgium, Denmark, France, Germany, Ireland, Luxembourg, the Netherlands, Sweden and the UK.

Two Irish companies (Mainstream Renewable Power and SSE Renewables, part of Airtricity Group) are partners in groups that are set to spend approximately €62 billion over the next 10 years developing wind farms off the British coast. The British Crown Estate, responsible for the development of the coastline has issued the exclusive rights. Mainstream Renewable Power have partnered with Siemens Project Ventures to develop 4,000MW in the Hornsea zone. SSE Renewables have a one-quarter share with RWE NPower Renewables, Statoil and Statkraft for rights to develop wind farms with a 9,000MW capacity on the Dogger Bank in the North Sea.

Bord Gais Energy (BGE) completed in December of 2009 the takeover of Cork-based renewable energy company SWS Natural Resources, one of the largest wind generators in Ireland. The transaction, worth over €500m was welcomed by the Minister for Energy and Natural Resources Eamon Ryan.

The Economic and Social Research Institute (ESRI) has issued a report recently stating that the wind energy market in Ireland can deliver enough wind generated electricity to meet Ireland's 2020 targets of achieving 40% of its electricity from renewable sources. The report also says that there should be provision of more infrastructure to ensure that renewable energy can be delivered effectively to homes and businesses and also to enable export of excess power. The ESRI has said that there should not be subsidies for offshore wind and tidal or wave energy, as there will be more onshore energy than "we can handle." However, the ESRI does support R&D in these areas.

EirGrid, which operates the state's electricity transmission system announced that the amount of electricity generated by Ireland's wind farms broke the 1,000MW threshold for the first time on 24 October 2009, equivalent to enough power to supply needs of 650,000 homes. Dermot Byrne, chief executive of Eirgrid said, "This recent high level of wind generation shows the significant potential we have in Ireland to utilize this clean, green, indigenous fuel."

Bord Na Móna, a semi-state body, has announced a proposed wind farm development in the Templeouhy area (Laois, Tipperary and Kilkenny). The development will be known as Bruckana Wind Farm and will have a generating capacity of approximately 40MW and will comprise 16 wind turbines. When fully operational, the wind farm is expected to produce enough energy to supply the needs of approximately 22,000 homes. Bord Na Móna expect to submit the planning application in early 2010.

German wind developer Abo Wind has secured contracts with German banks Commerzbank and NordLB to finance a 20MW wind station in Gortahile, County Laois in Ireland. Commissioning is set for late summer 2010. The €42m project is expected to generate 76GWh of energy per annum when fully operational. Abo Wind also financed projects in 2009 in Ireland amounting to €71m.

EirGrid recently announced its new Gate3 program. This will allow generators of electricity to receive offers from EirGrid for the latest grid connection process. Under this new program, EirGrid expects that 38% of Ireland's energy connected to the grid will be from renewable sources.

Marks & Spencer has extended its contract with independent energy supplier Energia to purchase renewable electricity equivalent to the amount used to power all of its Republic of Ireland stores and offices. Under the contract, Energia will supply Marks & Spencer with renewable energy from a range of wind farms and has a 245MW of renewable capacity contracted within its energy portfolio and a further 370MW in its development pipeline to be completed by 2012.

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# Country focus – Canada

## Tax credit tender or feed-in tariff

Ranking	Issue 24	Issue 23
All renewables index	9	9
Long-term wind index	6 <sup>1</sup>	6 <sup>1</sup>
Near-term wind index	9	9

Source: Ernst & Young  
1. Joint

In renewables terms, the hydro-dominated Canadian market has added only modest capacity across the 13 provinces and territories in recent years, when considering the available space and resource.

This has been a result of a moderate federal tax credit being insufficient to foster an entrepreneur market. The existing capacity has largely been developed through utility tenders for projects at a provincial level. This has led to a challenging market for all to operate in, as the irregular nature of this system increases market uncertainty and holds back long-term investment plans.

## Driving ahead in Ontario

The Ontario provincial government has reorganized this barrier to investment and, with a desire to create green jobs, established a feed-in tariff for renewable energy projects.

Ontario's Energy and Green Economy Act 2009 established a feed-in tariff and project application process based heavily on the German and Spanish feed-in tariffs, providing the following support:

Onshore wind:	CA\$135/Mwh (€90/Mwh)
Offshore wind:	CA\$190/Mwh (€126/Mwh)
Solar PV:	CA\$443/Mwh - CA\$802/Mwh (€294/Mwh - €532/Mwh)
Small hydro:	CA\$122/Mwh - CA\$131/Mwh (€81/Mwh - €87/Mwh)

Additionally incentives are provided to encourage First Nation and community based projects.

The tariff provides a 20-year power purchase agreement (40 years for hydro projects) with the Ontario power authority (OPA).

The legislation also provided for domestic content requirements, being the mechanism that the Ontario provincial government hope will stimulate green jobs. The requirements are (for systems greater than 10kw):

Wind projects: 25% currently, rising to 50% by 2012

Solar PV projects: 5% currently, rising to 50% by 2010

Already the market has started to respond, illustrated by Canadian Solar's commencement of site selection and approvals process for a 200MW module manufacturing facility in Ontario.

## The Ontario market in 2010

Ontario's renewable energy market in 2010 is expected to continue gathering pace and momentum.

The OPA has received an overwhelming response for project application. As of December 2010 the OPA estimated that over 1,000 applications had been submitted, which represented c.8GW of capacity and is currently processing these - expecting to start awarding contracts at the close of Q1 10.

The estimated 2.5GW of current available transmission connection was oversubscribed by three times within two months.

The OPA will award power purchase agreements to these projects that are closest to being construction ready. While some projects have financial close requirements in place, other developers have the challenge of moving projects with successful applications to financial close.

Given the construction period required for renewable energy projects, the feed-in tariff would not impact Ontario's installed capacity base during 2010; however, the need for renewables financing has now never been higher.

Developers seeking to raise finance are finding that equity is proving challenging. There are several routes being developed and our experience shows that, as in other more mature markets, each project or portfolio should be considered on its own merits. Joint ventures with strategic partners, private equity (often requiring a portfolio basis), mezzanine finance or part/full project disposal are some of the routes to equity we have secured for clients across the global renewable energy sector.

Ernst & Young has recently established a dedicated renewable energy team in Canada, building on extensive European experience, to help all stakeholders in the growing renewable energy market.

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# Country focus – Poland

## Feed-in tariff & green Certificate

Ranking	Issue 24	Issue 23
All renewables index	16	15 <sup>1</sup>
Long-term wind index	16 <sup>1</sup>	16 <sup>1</sup>
Near-term wind index	13 <sup>1</sup>	14 <sup>1</sup>

Source: Ernst & Young  
1. Joint

The Spanish energy producer Iberdrola, which owns three operational wind farms in Poland (Karścino - 69 MW, Kisielice - 40.5 MW, Malbork - 18MW) is on the verge of completing another. Iberdrola is the current leading foreign investor in the wind energy sector in Poland, closely followed by Portuguese energy producer EDP.

On 15 October 2009, the largest wind farm in Poland was officially launched by EDP in Margonin. The project is operated by Neolica Polska Sp. z o.o. (a subsidiary of EDP) and has a total installed capacity of 120MW (part still under construction). The wind farm consists of 60 turbines (2MW each) and will generate approx. 260,000MWh annually.

The following wind farms are also under construction or recently commissioned at the end of 2009:

- ▶ 41MW near Suwałki (RWE)
- ▶ 40MW in Tychowo (Global RPI)
- ▶ 50MW in Karcino (Dong Energy)
- ▶ 38MW in Golice (Acciona)
- ▶ Other: 69MW in Gołdap, 30MW in Karnice, 26MW in Skrobotowo

Despite a significant increase in wind capacity in 2009, it is estimated that electricity companies have not met the 2009 requirement to obtain 8.7% of electricity sales volumes from RES. Statistical data from December 2009 suggests a decrease in electricity sales to end customers, caused by the economic slowdown with sales electricity volumes to end customers amounting to 112TWh. To meet the 8.7% target requires electricity sales companies to present green certificates corresponding to approx. 9.5-10TWh. In 2008, the actual number of green certificates presented corresponded to 6.5TWh. It is estimated that there will be a shortage of approx. 1.6TWh of green certificates on the market, with the same scenario expected in 2010.

This shortage in green certificates motivates electricity sales companies to secure their required certificates in advance. Two of the four largest Polish vertically integrated power companies (ENERGA and TAURON) have recently entered into long-term agreements securing a part of their demand for green certificates.

ENERGA-OBRÓT S.A. and Relax Wind Park I (EDP) entered into a 15-year contract for the sale of green certificates. It is estimated that the annual green certificates from this contract will correspond to 250,000MWh.

Polska Energia - Pierwsza Kompania Handlowa (part of TAURON Polska Energia Group) has signed four agreements with subsidiaries of Polish Energy Partners (PEP) - Amon and Talia. The agreements involve the sale of electricity generated in PEP's wind farms (Łukaszów and Modlikowice) and the corresponding green certificates over the period of 15 years. The total value of the four agreements amounts to PLN867.3m (€212m).

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# Country focus – Brazil

## Tender

Ranking	Issue 24	Issue 23
All renewables index	19 <sup>1</sup>	17 <sup>1</sup>
Long-term wind index	22	21 <sup>1</sup>
Near-term wind index	17	16

Source: Ernst & Young  
1. Joint.

Through its Proinfra (Program for Incentive of Alternative Electric Energy Sources) program, the Brazilian government has promoted its strategic objective of enhancing its energy security. The project encourages the use of renewable energy sources such as wind, biomass and small hydroelectric power stations, reducing greenhouse gasses and creating jobs.

According to data from the 2009 National Energy Balance, published by the Energy Research Corporation, 85.4% of Brazil's current energy supply comes from renewable resources, of this three-quarters comes from hydroelectric sources.

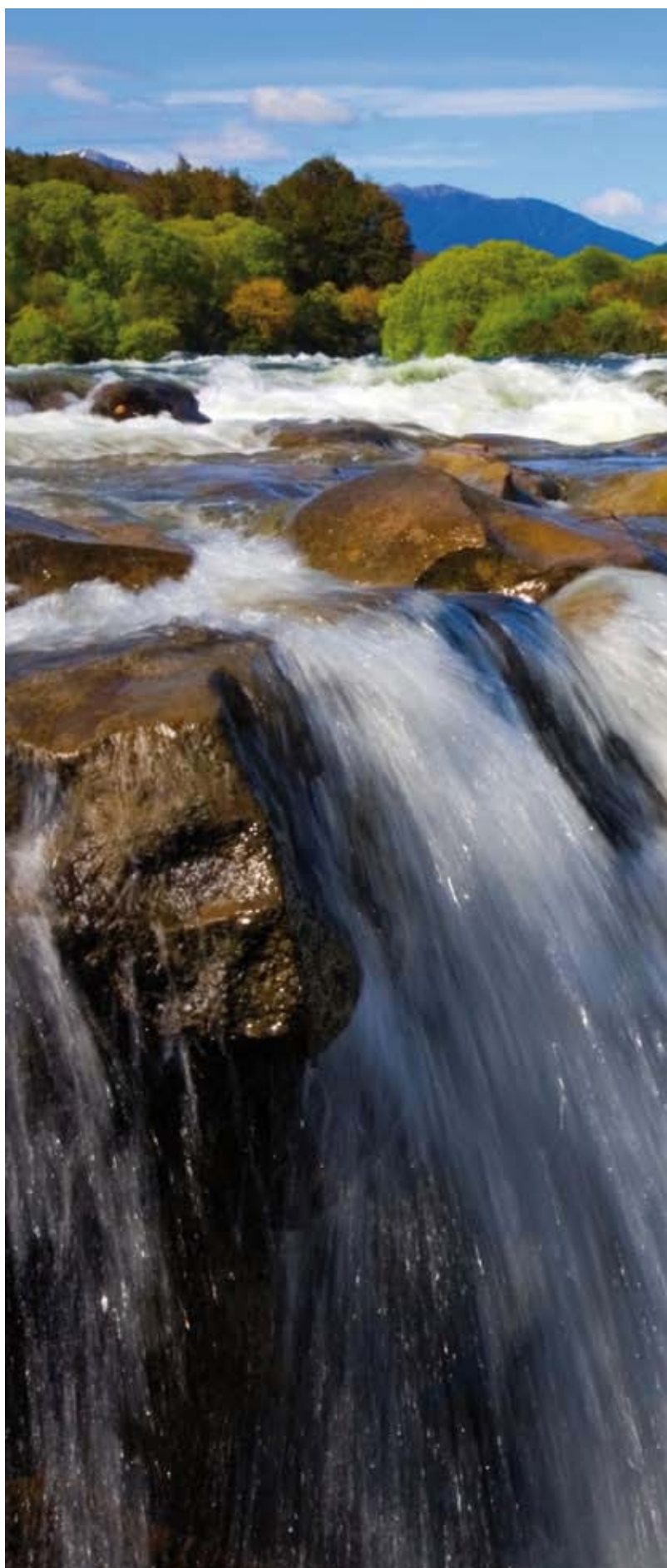
Since the implementation of Proinfra, wind energy has grown from 22MW in 2003 to 602MW in 2009. Currently, 10 projects are under construction with total capacity of 256.4MW with an additional 45 projects already approved by ANEEL (Brazilian Electricity Energy Regulatory Agency) with the potential of generating 2,139.7MW. Also in wind, Siemens has announced they are to build a wind turbine factory in Brazil.

In December 2009, ANEEL conducted the country's first wind energy auction, contracting 1,800MW through 71 wind power plants with delivery scheduled for July 2012. The objective of the auction was to purchase additional energy for the National Integrated System for 2012. According to the Brazilian Wind Power Potential Report by the Electric Energy Research Center (CEPEL), there is a potential for 145,000MW of wind power energy. The average price/MWh reached in the last wind energy auction held in December 2009 was R\$148.39 (€59.33).

The next large energy auction is to be that of the Belo Monte hydroelectric complex for 11,181MW of capacity, which is to use the same pricing methodology adopted in the auctions for the Rio Madeira hydroelectric complex. Prices negotiated for the Rio Madeira were R\$ 71.4MWh (€28.55MWh) – Jirau and R\$78.9MWh (€31.55MWh) – Santo Antonio, for a total capacity of 3,150MW and 3,450MW respectively.

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# The Copenhagen Accord: what now for power and utilities companies?

The following is an extract from the full white paper **The Copenhagen Accord: what now for power and utilities companies?** available from [ey.com/powerandutilities](http://ey.com/powerandutilities)

The political agreement known as the Copenhagen Accord was officially acknowledged by the Copenhagen conference in the early hours of Saturday, 19 December 2009. Though it is not a legally binding treaty, it is the first global agreement to specify that global temperature rises should be kept below two degrees Celsius (2C) and to assign mitigation actions for both developed and developing countries.

What will it mean for the power and utilities sector?

As had been widely expected, the Copenhagen Accord did not achieve its objective of a successor treaty beyond the first Kyoto Protocol compliance period from 2012; however, it is still a step forward in reaching international consensus on climate change treaties.

There are three major implications for power and utility companies:

1. Continued uncertainty regarding investments
2. Need to reconsider use of offsets to meet emission reduction targets
3. Need for independent verification of emission reductions

## 1. Investment uncertainty

In the absence of a long-term policy framework for carbon emission reductions, it will continue to be difficult for power and utilities companies to commit to low-carbon technologies. Without unilateral national-level actions, investment is likely to follow the best-established and lowest-cost technologies (gas, coal and onshore wind), rather than more risky low-carbon technologies such as next-generation nuclear, carbon capture and storage (CCS), offshore wind and solar power.

Rather than agreeing a “top-down” global carbon budget, it now appears probable that “bottom-up” national policies will dominate, with different mechanisms and targets adopted in different regions. However, there is a significant gap between the current national plans and the cuts needed to meet the 2C target. Utilities must therefore prepare for the possibility that current national emissions plans may be tightened as negotiations continue up to 2012.

Since local policy decisions will continue to dominate utilities’ investment agendas, decisions will be based on the prevailing market conditions, regulations and incentives rather than the global carbon abatement potential of any project. Different priorities will surface depending on the market.

In competitive markets, major investments are likely to be delayed until the policy environment is more certain at either a local or global level.

### Copenhagen Accord: a summary

Achieved	Unfinished business
First time that the world (in effect) has agreed to aim to restrict global temperature rises to less than 2C above pre-industrial levels	No target date set for global emissions to peak and then decline Accord is not legally binding and no deadline has been set for a legally binding treaty
Developed countries to submit plans to the UN to cut emissions; plans will be monitored and verified internationally	No globally agreed target for emission reduction by either 2020 or 2050
Developing countries to submit reports on their plans to reduce emissions growth; plans to be verified domestically, subject to international consultation	No globally agreed target for emission reduction by either 2020 or 2050
Developed countries to provide US\$30 billion fast start funding (from 2010 to 2012) to help poorer countries adapt to climate change, increasing to US\$100 billion per year by 2020 to support mitigation, adaptation and reduced deforestation. Agreed to set up the Copenhagen Climate Fund as part of the future mechanisms	Agreement in principle only; no specifics worked out yet

# The Copenhagen Accord: what now for power and utilities companies? (cont'd)

In rate-regulated markets, power and utilities companies must negotiate with regulators for allowances to invest in low-carbon technologies (which tend to carry higher capital costs), and to allow investments in transmission capacity to transport renewable energy from source to demand centers. In the absence of a global deal mandating comparable efforts across regions, regulators may struggle with balancing their responsibility to protect consumers from rising prices while allowing utilities to invest to reduce carbon emissions.

In developing countries, much of the new financing may well find itself targeted at low-carbon generation schemes, but the mechanisms for allocating these funds are far from being finalized.

Utilities will need to review the assumptions behind their investments, and consider the impact of this Accord. Going forward, it's likely that this uncertainty will affect financing models – with more emphasis on risk sharing through joint ventures, partnerships and strategic investment using government stimulus funds and loan guarantees.

## 2. Availability of carbon offsets

With no successor to the Kyoto Protocol post-2012 currently on the table, international carbon trading mechanisms have been left in some disarray. Those utilities planning to use international carbon offsets, such as certified emission reduction (CERs), to meet their targets should review their exposure and work out contingency plans based on different scenarios.

Supply of these credits is likely to become more constrained as CER-generating countries use future mitigation projects to meet domestic targets rather than selling offsets to developed countries. Emission reductions to meet domestic targets are unlikely to be authorized by the United Nations Framework Convention on Climate Change (UNFCCC) for international offsets as this would be “double counting.”

If the supply of offsets is uncertain, so is the level of demand. The largest existing market, the European Union, had offered a more ambitious target of 30% abatement by 2020 as part of its negotiation; however, tough targets from other countries did not materialize so the EU is likely to stay with the 20% target, which it should meet through a combination of existing policies and reduced demand due to the economic downturn.

Demand could, however, pick up from other regions. Offsets feature significantly in the US cap-and-trade scheme outlined in the bill which is currently going through Senate Committees as the Clean Energy Jobs and American Power Act. Japan and Australia are both expected to make extensive use of international offsets if they are to meet their emission reduction targets.

Utilities need to rethink their strategies for carbon compliance if competition for international offsets becomes more intense. Strategic planning to identify domestic offset projects can help to determine a fallback carbon mitigation cost. Work continues on reforming the CDM and there are opportunities for utilities to influence the debate around project eligibility and the treatment of CCS.

## 3. Independent verification

“Verification” became a robustly contested word during the Copenhagen negotiations, as China and other developing countries objected strongly to the impact of international verification on their national sovereignty.

However, as far as power and utilities companies are concerned, the difference between domestic and international verification is slight – either way, all facilities will need robust procedures in place to monitor and report carbon emissions.

The role of independent assurance organizations which can work both nationally and internationally will undoubtedly be important in maintaining integrity of the agreements made under the Accord. Power and utilities companies should start to work proactively with governments and organizations familiar with international audit processes in order to set up a system that is practical, rigorous and effective.

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# Commentary: guidance notes

## Long-term index

As stated on page 2, the individual technology indices, which combine to generate the all renewables index, are made up as follows:

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

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

## Renewables infrastructure index

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

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

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

## Technology factors

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

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

Other renewable energy resources include small hydro, landfill gas and wave & 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/or structures. The most successful incentives and structures have been direct RE tax breaks or brown energy penalties, accelerated tax depreciation on RE assets and tax-efficient equity investment vehicles for individuals.
3. Grant/soft loan availability - 9%: grants can be available at local, regional, national and international levels, and may depend on the maturity of a technology as well as the geographical location of the generating capacity. Soft loans have historically been used in pioneering countries of RE 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 to published targets. Higher scores are given if ambitious targets have been set and policy framework is in place to accelerate development. The realism of targets is taken into account as well as the seriousness with which they are being pursued (e.g., penalties in place for non-compliance).
5. Current installed base - 8%: high installed bases demonstrate that the country has an established infrastructure and supply chain in place, which will facilitate continued growth and, in particular, encourage the re-powering of older projects.
6. Resource quality - 19%: for example, wind speeds and solar intensity.
7. Project size - 15.5%: large projects provide economies of scale and a generally favorable planning environment, which facilitates project development financing.

## Near-term wind index

As stated on page 2, the near-term wind index focuses on factors of most immediate concern to near-term investment in wind energy. The scoring follows the same methodology as for the long-term wind index, but with a more focused set of parameters and a tailored weighting. Therefore, the indices consider the following, on a weighted basis, for both onshore and offshore wind separately:

- ▶ Power offtake attractiveness - 27%
- ▶ Tax climate - 8%
- ▶ Resource quality - 14%
- ▶ Market growth potential (early 2010 to end 2011) - 40%
- ▶ Project size - 11%

In the offshore near-term wind index, countries with no projects estimated to reach construction in the next two years (early 2010 to end 2011) are excluded.

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

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



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# Glossary

Abbreviation	Definition
CAI	Country attractiveness index
CDM	Clean Development Mechanism
CSP	Concentrated solar power
DECC	Department of Energy and Climate Change
DTI	Department of Trade and Industry
EIB	European Investment Bank
EPC	Engineering, Procurement and Construction
ESRI	Economic and Social Research Institute
EWEA	European Wind Energy Association
GW	Giga watt
ITC	Investment Tax Credit
KW	Kilo watt
M&A	Mergers and acquisitions
MW	Mega watt
MWh	Mega watt hour
Ofgem	Office of the Gas and Electricity Markets
OPA	Ontario power authority
PPA	Power purchase agreement
PTC	Production tax credit
PROINFA	Programme of incentives for alternative electricity sources
PV	Photovoltaic
RE	Renewable energy
REA	Renewable Energy Association
REC	Renewable energy certificate
RES	Renewable energy source
ROC	Renewables obligation certificate
RPS	Renewable portfolio standard
SDE	Subsidie Duurzame Energy
TWh	Tera watt hour

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- ▶ Landfill gas
- ▶ Hydro
- ▶ Carbon capture and storage

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