

# *Renewables Deals*

2010 analysis  
and 2011 foresight

*A look at global M&A  
activity in the renewable  
power and energy  
efficiency sectors*



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## *Methodology and terminology*

*Renewables Deals* includes analysis of all global renewable energy and clean technology M&A deal activity. We define renewable energy deals as those relating to the following sectors: biofuels, biomass, geothermal, hydro, marine, solar and wind. Renewable energy deals relate to the acquisition of (i) operating projects involved in the production of renewable energy and (ii) companies manufacturing equipment for the renewables sector. We define clean technology deals as those relating to the acquisition of companies developing energy efficient products for renewable energy infrastructure. We exclude deals relating to nuclear power assets and deals where only a minority of the business's activity is in renewables. This year, the analysis is based on transactions from Clean Energy pipeline's proprietary M&A database, provided by Venture Business Research. This covers both 2009 and 2010 data in this year's edition. We note that other database providers have been used in previous years.

The main dataset in the report covers completed M&A deals only, and excludes Initial Public Offerings (IPOs) and deals which are pending for regulatory, legal or financial reasons. A selection of top pending deals and top IPOs is included separately in the report. The Asia Pacific region is deemed to include Australasia, except where otherwise explicitly stated. Deal values are stated as the consideration value announced or reported including any assumption of debt and liabilities. Figures relate to the actual stake purchased and are not grossed up to 100%. The analysis also includes deals with undisclosed value. Deals where the transaction value is undisclosed are assigned an average transaction value using a methodology derived from Clean Energy pipeline's proprietary M&A data.

# Introduction

*Welcome to the third edition of **Renewables Deals**, an annual review by PwC of deal-making in the renewable energy sector. It sits alongside its companion report – **Power Deals** – and, together, the two publications provide a comprehensive look at trends and the outlook for M&A activity in the power utilities sector.*

This report examines the rationale behind the overall trends and the key individual deals in the renewable energy sector. This year we have expanded our analysis to cover the increasingly important field of energy efficiency as well as looking separately at important initial public offering (IPO) activity. We also highlight, in a series of deal dialogues throughout the report, some of the critical issues for companies engaging in deal activity within the sector, drawing on our global experience as an adviser to players in major deals in renewable energy markets.

The renewables sector is proving a busy market for M&A. Deal-making is running at very high levels, albeit for smaller values than in previous years. Apart from hydro, which has long been cost-competitive in the marketplace, the pattern of investment and deals in renewables continues to be strongly influenced by regulatory incentives. There is an element of taking stock as some governments review the best way to balance the triple objectives of affordability, security of supply and cleaner energy in a context of tighter public finances.

There is strong growth in a number of sectors. We look at the gathering pace of activity in the solar power generation and energy efficiency sectors. We examine the changing mix of buyers and sellers as utility companies move back from M&A to concentrate on capital project investment. We discuss the east-west balance of power in the expanding windpower market and the increasing globalisation of companies in this sector. Looking forward, we see a busy year ahead as some of these themes intensify and governments clarify any adjustments of regulatory regimes to match their fiscal constraints.



**Manfred Wiegand**  
Global Utilities Leader

# Report highlights

## ***A busy deal sector but smaller values***

The renewables sector is the focus of lively deal activity. The number of deals has grown by two-thirds year-on-year although total deal value is down by a third. Europe in particular, and the Asia Pacific region, led the trend towards more but smaller deals. In North America total deal value was more resilient. Indeed, target value in North America target value increased US\$3.9bn (43%) year-on-year while Europe went in the opposite direction with an US\$18bn (58%) fall.

## ***Solar power plant and energy efficiency sectors come of age***

Solar deal volume is rivaling wind, each with just under a third share of all renewables deals, as momentum behind the sector gathers pace. A series of solar technology and operational asset deals reflects the growing role of solar power plants. Energy efficiency is also becoming a deal hot spot. The number of energy efficiency deals grew 225% year-on-year and total value was up 63%. Two-thirds (65%) of worldwide energy efficiency deal value is in North America where efficiency is second only to wind in total value terms.



## ***IPOs flow as Chinese gear up for growth***

Chinese renewables companies are looking at major expansion with a series of IPOs on the Hong Kong stock exchange in 2010 and more planned in 2011. Chinese wind turbine companies Sinovel and Xinjiang Goldwind will provide formidable competition for western manufacturers such as Vestas, Gamesa, GE and Siemens. The IPO proceeds will enable them to expand their pipelines as well as strengthen R&D to compete in global markets for the next generation of 6 MW+ turbines. Elsewhere in the wind sector, the days of independent operators look increasingly numbered as operators such as Clipper Windpower get taken over by large multinational companies.

## ***Utility companies take a back seat***

We predicted in last year's report that utility companies, who have been the biggest buyers of renewables assets in the past, might reign back purchases in the face of massive capital investment challenges. This has proved to be the case. Purchases by power utility companies were down significantly – from US\$15.8bn in 2009 to US\$3.0bn in 2010. Enel's IPO of its Enel Green Power unit was the biggest 2010 utilities deal but, in an interesting reversal, Iberdrola announced in March 2011 that it intended to delist Iberdrola Renovables by buying back the 20% stake that it floated in 2007. Valuation is not the only motive here. The move was followed by an announcement that Iberdrola is also gaining investment from a division of Qatar's sovereign wealth fund and forming a strategic partnership in a move that will change the balance of large investor interests in the company.

## Deal totals: a busy sector

*More deals for smaller values. 2010 was a busy year for renewables deal-making with the number of deals rising by two-thirds year-on-year, from 319 in 2009 to 530 in 2010 (figure 1). But this was accompanied by a big fall in total value, from US\$48.8bn to US\$33.4bn. Just over a third - US\$5.7bn - of this US\$15.4bn fall in value can be attributed to two fairly exceptional large European sales by Endesa and E.ON in 2009 that boosted that year's total.*

A year-on-year US\$12.5bn fall in hydropower deal value was a major factor in the lower deal value transacted in the sector. There were a number of large deals for hydro assets in 2009 but this was not repeated to the same extent in 2010. Instead, hydro followed the trend in the rest of the sector with a larger number of small deals (figure 3). Only two hydro deals feature in the top ten deals (figure 7).

It was in the wind and solar power sectors that the pattern of more deals for smaller values was most evident. These continue to be the largest sectors in terms of the volume of deals. The number of deals rose dramatically – by 58% in wind and 48% in solar – but total values were down, by 24% in wind and 20% in solar (figure 3). Investors, developers and operators were extremely busy but the typical deal size was smaller.

This reflects a greater focus on smaller deals to fill technology gaps and more roll-out deals as completed projects are sold to financial owners. Utility companies reigned back purchases in the face of massive capital investment challenges. There were relatively few big portfolio additions. Purchases by power utility companies were down significantly – from US\$15.8bn in 2009 to US\$3.0bn in 2010 (see figure 4). Power utilities, and other investors, will also be taking stock of regulatory reviews in some European countries including Spain, Germany, Italy and the UK.

From a low base, the biggest sector growth came in the field of energy efficiency where deal numbers rose 225% and total deal value was up 63% year-on-year. We look at this activity in more detail later in this section. We also examine the dynamics behind the biggest deals in our 'Deal Makers' section.

Behind the deal totals lie a number of themes, reflecting significant change in the industry. We examine these on the following pages.

**Figure 1: All renewables deals by value (US\$bn) and number of deals**

Number	2009	Number	2010	Change in 2010	
	Value		Value	% number	% value
319	US\$48.8bn	530	US\$33.4bn	66%	(32%)

### Technology and engineering entrants

We are seeing engineering, technology and chemicals companies stepping up their presence in the renewables value chain, either by diversifying and entering the market for the first time or by strengthening and extending existing positions. In one of the top ten deals of 2010, for example, chemicals company China Bluestar acquired Norwegian maker of solar-grade silicon Elkem (see 'Deal Makers' section for more details).

On the technology front, Sharp's US\$305m purchase of US company Recurrent Energy expands its photovoltaic (PV) footprint. Sharp has long had a solar manufacturing presence but the deal extends its operations from developing and producing solar panels to developing and marketing power generation plants. This also reflects solar PV manufacturers' increasing need to secure distribution through in-house development - a well-established strategy of turbine manufacturers in the wind sector. The timing of the move comes as the roll-out of larger-scale solar generation gains momentum.

### Nuclear and renewables interplay

Power engineering companies with long track-records as suppliers in the generation sector are establishing and extending their presence in renewables. The interplay between the nuclear and renewables sectors came into particular focus in 2010 as nuclear companies saw the opportunity to develop their carbon-free offering. French nuclear engineering company Areva, for example, made its first move into the solar power market with the US\$200m purchase of US company Ausra, a developer of solar thermal power technology.

The Areva purchase comes in anticipation of a growing market for the construction of concentrated solar power plants. It follows moves by other engineering groups such as Siemens who bought Israel's Solel, a manufacturer of solar thermal systems, in 2009. In the US, the interface between the nuclear and renewables sectors was also the territory for a major landmark deal with nuclear generator Exelon's first move into renewables through the purchase of John Deere Renewables (see later 'Deal Makers' section). The nuclear emergency in Japan, which is just unfolding as we go to print, could prompt further diversification by nuclear companies into renewables.

Figure 2: Quarterly tracking of deals – 2009 and 2010

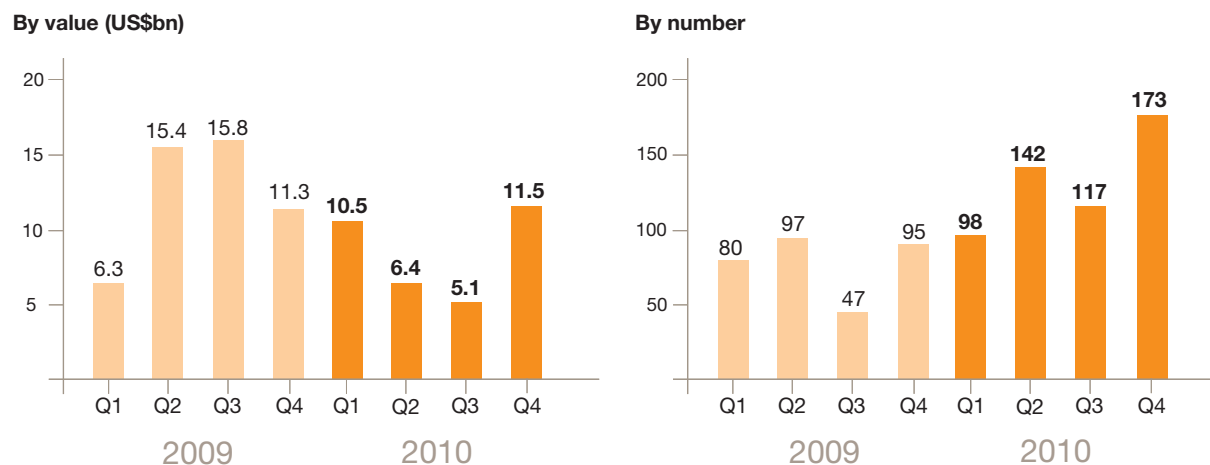
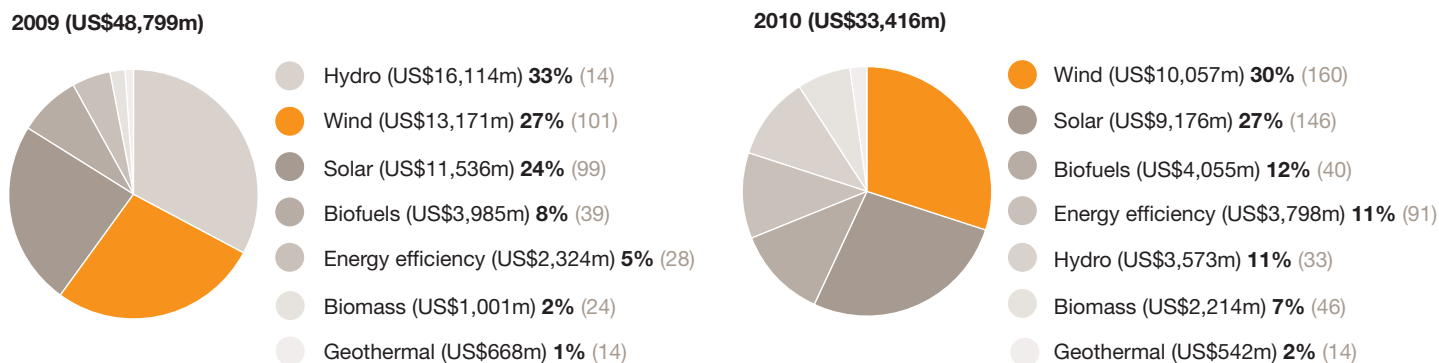


Figure 3: Renewables deals total deal value and percentage share by sector (Deal numbers shown in parenthesis)



### Solar power plant growth

Alongside the entry of power and technology companies, companies in the solar power industry have started to consolidate and strengthen their global presence. For example, US company SunPower bought European power plant developer SunRay Renewable Energy for US\$277m. SunPower has already been very active in solar power plant development in Italy and the purchase of SunRay gives it added capacity and a pipeline of developments in Europe and the Middle East.

Italy has been a hotspot for solar investment, in response to an attractive subsidy regime and in November 2010 saw Europe's largest single-operating photovoltaic solar power plant go live. The 70 megawatt (MW) photovoltaic power plant is near the town of Rovigo in north east Italy and was developed by US company SunEdison.

In an arrangement typical of solar power plant financing, the power plant was acquired by financial investors post-development, in this case energy private equity and infrastructure investment firm First Reserve.

In May 2010, First Reserve and SunEdison announced the creation of a joint venture for the acquisition of SunEdison's PV projects. The US\$362m Rovigo deal was the first of what is expected to be a series of transactions as projects are completed.

Private equity (PE) investment in the sector has also followed the scent of Italy's feed-in tariffs. In one of the largest deals announced in 2010, UK PE firm Terra Firma paid US\$933m for solar photovoltaic developer Rete Rinnovabile from Terna, the Italian grid operator. Rete Rinnovabile is targeting total capacity of 150 MW by the time of completion of the deal on 31 March 2011.

But, in a move that has unsettled investors, the Italian government announced in March 2011 that the existing solar power incentives, which were originally intended to run until 2013, will apply only to photovoltaic plants that connect to the grid by the end of May 2011. A new support scheme is to be introduced for solar plants that connect to the grid after June 1 2011. This is expected to set an annual cap on the cumulative capacity eligible for incentives.

### Biofuels

In the biofuels sector, oil and gas companies have been making significant ethanol investments in their search to diversify transport fuel sources. We discuss the largest deal of 2010 – Royal Dutch Shell's US\$1.6bn partnership with Cosan – in the Deal Makers section. It was not alone. The Shell initiative followed an earlier 2008 investment in biofuels by BP when it created Tropical BioEnergia along with two Brazilian agribusiness and sugar and ethanol companies. As we go to print in March 2011, BP has announced a further investment in the Brazilian ethanol sector with the purchase of a US\$680m 83% share of bioethanol and sugar producer Companhia Nacional de Acucar e Alcool (CNAA). Earlier in 2011 Petrobras, Brazil's national oil company, was reported to be considering a stake in a local ethanol producer but, at the time of writing, the reports have not been confirmed. Transport accounts for around 21% of all carbon dioxide emissions and the potential for ethanol as an alternative fuel is immense.

Figure 4: Renewables deals by acquirer type – 2009-2010

	2009				2010			
	Number	Value (US\$m)	% number	% value	Number	Value (US\$m)	% number	% value
Alternative energy	70	13,654	35%	32%	79	7,341	40%	31%
Diversified	22	2,672	11%	6%	31	4,119	16%	18%
*Financial	45	6,184	23%	15%	42	5,111	21%	22%
Other	32	3,953	16%	9%	28	3,901	14%	17%
Utility	31	15,771	16%	37%	20	3,013	10%	13%
<b>Total</b>	<b>200</b>	<b>42,234</b>	<b>100%</b>	<b>100%</b>	<b>200</b>	<b>23,485</b>	<b>100%</b>	<b>100%</b>

\*Financial includes infrastructure and private equity funds

Note: based on the largest 200 deals by value, representing over 70% of total deal value in 2010

### *Energy efficiency*

Energy efficiency is an important growth area for a diverse range of companies in construction, engineering, technology and other sectors. Moves to make the construction of buildings more energy efficient, gain power management efficiencies through a convergence of energy and communications technology, and develop smart grids are all spurring activity. Energy efficiency transactions doubled their value share of all renewables deals between 2009 and 2010 (see figure 3), accounting for US\$3.8bn of deals out of the US\$33.4bn total of all deals.

Energy efficiency is a growth sector around the world but particularly in North America, where the energy savings potential is among the biggest in the world. Reflecting this, the majority of energy efficiency deals are North American, with a total value of US\$2.5bn in the region comprising around two thirds (65%) of worldwide energy efficiency deal value. The largest energy efficiency deal was the US\$300m purchase of energy management service provider The Linc Group by facility services company ABM. The deal comes as new building codes that aim to deliver a 30% energy saving from buildings are being introduced in the US.

Energy efficiency deals are often for smaller values or undisclosed sums. In an example of the latter, French glass and building materials company Saint-Gobain acquired 50% of US company Sage Electrochromics. Activated by a low-voltage current, electrochromic glass adapts its light and heat transmission – and so its tint – to the level of sunlight and the building's ambient temperature, without hindering external visibility. It significantly reduces the amount of energy consumed for air conditioning, heating and lighting. Saint-Gobain and Sage intend to build the world's first large-scale electrochromic glass plant in Minnesota, US.

### *IPO flow*

There has been a strong flow of IPOs in the renewables sector, dominated by Chinese companies going public on the Hong Kong exchange but also, in 2010, the US\$3.4bn flotation of Italian power company Enel's green energy arm, Enel Green Power. This IPO flow is not included in our main deal totals data but we look at the biggest IPOs separately in figure 5 and discuss the Enel and the Chinese deals in the 'deal makers' and Asia Pacific sections.

### *2010 review...*

...Smaller independent companies are slowly being squeezed out of the wind turbine market as big players, such as GE, Siemens and Vestas, compete globally. In 2010, Clipper Windpower was bought by UTC. The centre of gravity of the sector is also tilting between east and west. In an iconic move, Vestas announced the closure of some production facilities in its homeland of Denmark. A few months later it opened a wind technology R&D centre in Beijing to spearhead innovation in wind technology. The centre builds on Vestas' already-established manufacturing, sourcing and sales operations in China...

### *2011 view...*

...Both the east-west centre of gravity and the future of smaller independent wind turbine companies will be affected by developments following the IPOs of Chinese turbine manufacturers Goldwind and Sinovel. The sector will be watching to see the extent to which the IPO proceeds will be used for international expansion. Acquisition of independent companies could be a route to expansion in a sector where the costs of transporting large components inhibits the ability to use a single manufacturing hub.

## Deal makers: the 2010 players

*The largest deals of 2010 were dominated by a flow of renewables flotations (see figure 5). The largest was Italian company Enel's US\$3.4bn spin off of its green energy arm. But the bulk of IPO deal flow involved Chinese renewable power companies, with flotations on the Hong Kong stock exchange which we discuss in the later Asia Pacific section. China also featured in the largest solar deal, China National Bluestar's US\$2.1bn move for Elkem, a Norwegian manufacturer of solar-grade silicon. This deal remained pending at the year end.*

The list of completed deals was headed by two highly significant deals – Royal Dutch Shell's US\$1.6bn deal with Brazilian ethanol producer Cosan and US power generator Exelon's entry into windpower with the US\$900m purchase of John Deere Renewables (figure 7). Both deals represented landmarks of different kinds in the biofuels and wind sectors. Shell's US\$1.6bn alliance with Cosan is a major move in the quest by petrochemical companies to take carbon out of transport fuels.

The Shell/Cosan transaction is the first step in a joint venture. The two companies say that the alliance will enable them to establish a scalable and profitable position in sustainable biofuels – one of the solutions to take carbon out of the transport fuels sector over the next twenty years – by building a competitive position in the most efficient ethanol producing country in the world and by exploring opportunities to produce and sell ethanol and sugar globally.

In the US, the US\$900m purchase of John Deere Renewables by nuclear power generator Exelon has significance in the evolution of windpower and its integration into mainstream power generation. John Deere Renewables' roots lie in its parent company's farm machinery business and the development of early windpower using small-scale farm turbines. It has grown to include 36 completed projects in eight states with an operational capacity of 735 MW. About 75% of its output is sold under long-term power purchase agreements but Exelon will also gain access to approximately 1,400 MW of new wind projects that are in various stages of development, including 230 MW in advanced stages of development.

Exelon has long been a proponent of nuclear power as a low carbon option but the deal is its first move into owning and operating wind projects. It gives the company more options for future growth given the lack of momentum in US nuclear power development. Elsewhere in the US, another large power generation company, NRG Energy, also expanded its renewable portfolio (see North America section).

Figure 5: Top five renewable energy IPOs – 2010

No.	Value of transaction (US\$m)	Date announced	Company	Country	Exchange	Market sector	Type of purchase
1	3,402	28 Oct 10	Enel Green Power Spa	Italy	Milan Stock Exchange	Diversified	Operational
2	1,053	08 Oct 10	Xinjiang Goldwind Science & Technology Co. Ltd	China	Hong Kong Stock Exchange	Wind	Technology
3	643	17 Dec 10	China Datang Corporation Renewable Power Co. Ltd	China	Hong Kong Stock Exchange	Diversified	Operational
4	426	13 Oct 10	China Suntien Green Energy Corp.	China	Hong Kong Stock Exchange	Wind	Operational
5	352	22 Nov 10	Shanghai Chaon Solar Energy Science & Technology Co. Ltd	China	Shenzhen Stock Exchange	Solar	Technology

In Europe, Enel's flotation of Enel Green Power came as it sought to reduce debt following its acquisition of Spanish power utility company Endesa in 2009. The Enel Green Power flotation was oversubscribed but was priced towards the bottom of an already lowered price range. The divestment of renewable energy arms has been a key trend among power companies, most notably following the flotation of Spain-based Iberdrola Renovables in late 2007. Since then, however, the investment climate for renewables and the IPO environment in general has become more uncertain. Iberdrola Renovables shares have more than halved since flotation and, as we note in the 'highlights' section, the parent company plans a 2011 buy-back of the 20% of shares it does not already own in Iberdrola Renovables.

Also in Europe, Norwegian metals company Elkem was the seller in two significant 2010 deals. At the beginning of the year, it completed the US\$742m sale of some of its hydropower plants to state power companies. Norwegian legislation requires that power plants that are more than one-third owned by private owners must be returned to the state at no cost after 60 years, necessitating the sale of such assets before the deadline for reversion.

**Figure 6: Operational vs technology purchases – 2009-2010\***

	2009				2010			
	Number	Value (US\$m)	% number	% value	Number	Value (US\$m)	% number	% value
Operational	150	32,968	75%	78%	127	17,645	64%	75%
Technology	50	9,266	25%	22%	73	5,840	36%	25%
<b>Total</b>	<b>200</b>	<b>42,234</b>	<b>100%</b>	<b>100%</b>	<b>200</b>	<b>23,485</b>	<b>100%</b>	<b>100%</b>

\*Note: based on top 200 deals by value

**Figure 7: Top ten renewables deals 2010**

No.	Value of transaction (US\$m)	Date announced	Target name	Target nation	Acquirer name	Acquirer nation	Market sector	Type of purchase
1	1,625	15 Dec 10	Cosan Ltd.	Brazil	Royal Dutch Shell plc	The Netherlands	Biofuels	Operational
2	900	15 Nov 10	John Deere Renewables LLC	USA	Exelon Corp.	USA	Wind	Operational
3	742	04 Jan 10	Elkem Energi Lakshola AS; Elkem Energi Siso AS	Norway	Norsk Vannkraftproduksjon AS	Norway	Hydro	Operational
4	729	04 Feb 10	Waneta Dam	Canada	British Columbia Hydro and Power Authority	Canada	Hydro	Operational
5	565	09 Nov 10	Comber Wind Farm (166 MW)	Canada	Brookfield Renewable Power Fund	Canada	Wind	Operational
6	500	29 Jun 10	Cedar Point Wind Energy Project (250 MW)	USA	Enbridge Inc.	Canada	Wind	Operational
7	440	10 Feb 10	El Andevalo Wind farms (244 MW)	Spain	Iberdrola Renovables SA	Spain	Wind	Operational
8	414	20 Jul 10	Africana Energia SL	Spain	Ortiz Construcciones y Proyectos SA, TSK Group	Spain	Solar	Operational
9	389	15 Nov 10	HEAG Sudhessische Energie AG	Germany	HEAG Holding AG – Beteiligungsmanagement der Wissenschaftsstadt Darmstadt	Germany	Wind	Operational
10	383	16 Feb 10	Energy Developments Ltd.	Australia	Pacific Equity Partners	Australia	Biomass	Operational

Later in the year, Elkem announced that talks were underway for its takeover by China Bluestar in a US\$2.1bn deal. The deal would give Elkem access to renewables growth in China while enabling Bluestar to strengthen its competitiveness in the solar market and gain technological know-how. Elkem technology enables highly energy-efficient and environment-friendly production of solar-grade silicon. The Bluestar move reflects an intensification of efforts by chemicals companies such as Bluestar and Dupont to gain solar market share and step up technological innovation. In a smaller 2010 deal, for example, US specialty chemical maker Solutia bought privately held Etimex Solar for US\$326m.

Infrastructure operators, such as oil pipeline companies, and infrastructure investors are getting increasingly involved in the sector through the purchase of completed, operational assets and, in some cases, the development of such assets. The attraction is the steady long-term return on investment provided by renewable incentive mechanisms. Two of the North American deals in the 2010 top ten list reflected this trend – Brookfield Renewable Power Fund’s US\$565m acquisition of Canada’s 166 MW Comber Wind project and Enbridge’s US\$500m purchase of the Cedar Point Wind Energy Project in Colorado, US, from its developer, Renewable Energy Systems Americas.

Brookfield Renewable Power Fund is a leading Canadian income fund while Enbridge is best known for its oil pipeline and gas transportation infrastructure. Both the Comber Hill and the Cedar Point windfarms have secured 20 year power purchase agreements for the sale of their electricity to state power authorities, giving assurance and predictability on investment returns.

The other main deals of 2010 and moving into 2011 are listed in figures 5, 7 and 8. We look at these in more detail in the relevant regional sections later in this report.

**Figure 8: Top five renewable deals announced in 2010 and pending at 31 December 2010**

No.	Value of transaction (US\$m)	Date announced	Target name	Target nation	Acquirer name	Acquirer nation	Market sector	Type of purchase
1	2,100	26 Oct 10	Elkem AS	Norway	China National Bluestar (Group) Co. Ltd	China	Solar	Technology
2	1,760	11 Dec 10	ETH Bioenergia SA	Brazil	Petroleo Brasileiro SA	Brazil	Biofuels	Operational
3	933	19 Oct 10	Rete Rinnovabile Srl	Italy	Terra Firma Capital Partners Ltd	UK	Solar	Technology
4	264	13 Dec 10	Swedish District Heating Business	Sweden	Macquarie Group Ltd	Australia	Biomass	Operational
5	175	15 Jun 10	Jan Reichert (353 MW development pipeline)	Poland	AES Corp.	USA	Wind	Operational

## Deal dialogue: Japanese international renewables expansion\*

*Mitigating the risk involved in international investments, especially when entering newly developing markets, is one of the key challenges facing Japanese companies.*

The Sogo Shosha integrated trading companies have already established a significant footprint across the world. But utility companies, who have long been purely domestic players, are less accustomed to the risks involved in investment into developing countries. These include the challenge of finding appropriate local partners, preparing for volatile feed in tariffs in some territories, and securing equity/debt financing.

Some players have started to invest in established developers with a secured pipeline of projects rather than directly into assets. This M&A approach has many advantages (local staff, secured contracts, capacity to gradually invest) but requires robust multi-disciplinary due diligence and sensitivity analysis to properly value the company and assess the pipeline by layers of risk and financial attractiveness.

Most Japanese outbound renewables investment has focused mainly on developed countries including:

- Mitsui has agreed with Spanish construction major, FCC, to participate in a 50 MW concentrating solar power (CSP) project in Palma del Rio (Cordoba), Spain, through its subsidiary Mitsui Renewable Energy Europe.
- Mitsubishi Corporation has invested in the Changwat Lop Buri power generation project in Thailand. In terms of scale, the 73 MW solar photovoltaic (PV) project ranks among the world’s largest PV projects currently scheduled for production.
- ITOCHU Corporation and GE entered into a collaboration and cooperation agreement to identify co-investment opportunities in renewable energy worldwide.

- Sojitz Corporation has entered the US solar PV market with an investment in Solar Power Partners (SPP), the largest privately-held independent solar PV developer in the US. SPP owns, manages, and operates over 50 solar energy systems totaling c. 23 MW.
- Eurus Energy Holdings Corporation, a joint venture between Tokyo Electric Power and Toyota Tsusho, will commence the construction of a world-class mega solar power plant with a total installed capacity of 45 MW in California. Its commissioning is scheduled for June 2011. All of the PV panels for the project will be supplied by Sharp Corporation.
- Sharp Corporation’s US\$305m purchase of Recurrent Energy in the US (see ‘Deal Totals’ section).

\*Commentary written prior to March 2011 Japan earthquake

## Deal dialogue: Valuation – the green premium

*The term ‘green premium’ was coined to describe the price, relative to peers, investors were willing to pay for businesses with products exposed to the renewable energy sector.*

The premium reflected the perceived structural growth that existed in markets pursuing a low carbon agenda. But it has diminished as government expenditure and support for renewables has become less certain in the wake of the financial crisis.

Nonetheless, a legacy still remains in the form of a value gap between buyers and sellers. Sellers still seek significant premiums while buyers, reluctant to pay for uncertain growth profiles, are no longer prepared to pay significant multiples for these businesses.

The recent listing of Enel’s renewables-focused business Enel Green Power (EGP) is a case in point. Originally marketed at a 10.4 EV/Ebitda multiple, EGP made it to market at 8.4 EV/Ebitda, a significant fall from the lofty heights of its direct play wind flotation predecessors. Iberdrola, EDP and EDF all listed their renewables arms between 16.9 and 40.4 EV/Ebitda\*. Although unique businesses, with their own risk idiosyncrasies, the difference in investor perceptions is noteworthy.

As the value gap begins to narrow, thanks to greater stability in the macro-economy and a lowering of price expectations on the part of sellers, we are likely to see an increase in bidder competition for targets. As deal sizes increase and the availability of finance improves, financial investors will re-emerge, increasing prices and valuations, and pricing will swing back in favour of sellers, at least for a period of time.

The indecisive policy approach by governments to the sector creates uncertainty, and, in the minds of many investors, risk. This uncertainty translates directly into downward pressure on valuation metrics and, ultimately, to less appetite by investors to deploy capital into renewables. Within the wind and solar sectors, there are specific and dynamic trends also influencing value, in particular:

- Wind assets are seeing a resurgence of interest from investors as they seek a haven from the turmoil surrounding uncertainty in some governments’ policies in solar. This should translate into support for the pricing of generating assets and development pipelines.

- The global wind supply chain, still recovering from recession-driven sluggish demand, is showing signs of a recovery with a number of transactions trading for higher than usual multiples. Acquisition of technology and integration-plays, resulting in synergies, will drive competition for good businesses and improve valuation metrics.
- Overcapacity in the solar supply chain is driving M&A activity in an attempt to consolidate and drive down costs. Premiums are being paid for companies that provide a distribution platform for current product ranges or exposure to cutting-edge technology.

The recent return to US\$100+ priced oil, and the reaction to the nuclear emergency in Japan, should provide some further support to valuations.

\*Source: Company accounts; Capital IQ

## Deal dialogue: How EAM techniques can enhance deal value

*Embedding effective asset management (EAM) practices across the asset lifecycle helps in the successful completion of renewable energy M&A transactions. It reduces the initial investment and ongoing cost of ownership. It increases asset availability. It also supports a higher sale price in an exit transaction. Consequently, best-in-class developers are deploying EAM solutions as early as the design phase of renewable projects.*

Lifecycle costs can vary considerably, depending on the renewable technology deployed. For example, solar PV panels, once installed, require almost no routine maintenance. The required attention increases as the asset becomes less passive, as is the case with hydro, wind, geothermal, and biomass. Geography has an impact too – fleet maintenance is more demanding in a cold and wet location, such as the North Sea, compared to a dry and arid area, such as western Texas.

To increase value, the asset owner needs to be fully involved during development, including the pre-construction phase, choosing a design and selecting materials that will decrease lifecycle costs. For example, a wind turbine design that incorporates non-corrosive materials, has easy machine access for personnel and a fleet-specific maintenance programme can reduce ongoing maintenance costs.

Modern maintenance programmes help to mitigate the consequences of failure by using condition-based maintenance techniques such as online performance and vibration analysis, wall thickness monitoring and thermal imaging. These maintenance programmes must continue to be specified as third party maintenance providers change over the asset lifecycle.

Value is also enhanced when the asset owner defines not only the required machine performance but also the expected reliability for the project’s lifespan. Low failure rates mean that production goals can be met with less installed capacity than otherwise might be deployed. As a result, the upfront capital cost could be lower and the gain extracted from a deal may be correspondingly higher.

By emphasising EAM early during the development stage, the owner of the asset can realise optimal performance over the expected operating life of the investment. This will reduce the overall cost of ownership and increase capacity, which means a higher sale price when exiting the investment.

## Deal places: a focus on markets worldwide

Deal numbers in all the major regions rose year-on-year (figure 9). There were increases in both target and bidder numbers in North America, Europe and Asia Pacific. These included rises of 71% for targets in North America and 50% in Europe. Bidders from both these regions were out in force, particularly in North America where bidder numbers more than doubled, from 103 in 2009 to 209 in 2010. The number of bids from European buyers rose 41%, from 171 to 241.

Europe continued to deliver the largest number of targets, accounting for nearly half (48%) of all targets worldwide (figure 9). But target deal value was evenly split between Europe and North America. Both delivered US\$13bn worth of deals (a 39% share each). While North American target value increased US\$3.9bn (43%) year-on-year, European deal value went in the opposite direction with a US\$18bn (58%) fall.

The number of Asia Pacific targets nearly doubled, from 33 in 2009 to 64 in 2010. The region accounted for 12% of all deals in 2010. But total deal value in the region fell from US\$7.3bn to US\$3.6bn. However, these totals do not include the substantial flow of Chinese renewables IPOs that took place in 2010 (see figure 5).

Elsewhere, South America's share of worldwide deal value rose to 10% in 2010. The US\$1.6bn Shell/Cosan deal accounted for nearly all of the region's year-on-year increase, although it is notable that South American buyer activity also rose, albeit from a small base, with 13 deals contributing US\$1.4bn of total value.

Figure 9: Deals by target continent

Europe	2009	2010	% change
Value of deals (US\$m)	30,964	13,045	(58%)
Number of deals	171	256	50%
Average deal value (US\$m)	181	51	

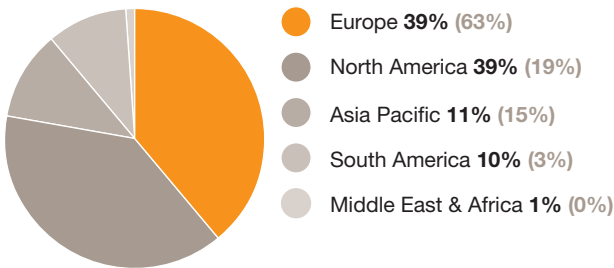
North America	2009	2010	% change
Value of deals (US\$m)	9,082	12,951	43%
Number of deals	106	181	71%
Average deal value (US\$m)	86	72	

South America	2009	2010	% change
Value of deals (US\$m)	1,423	3,390	138%
Number of deals	9	19	111%
Average deal value (US\$m)	158	178	

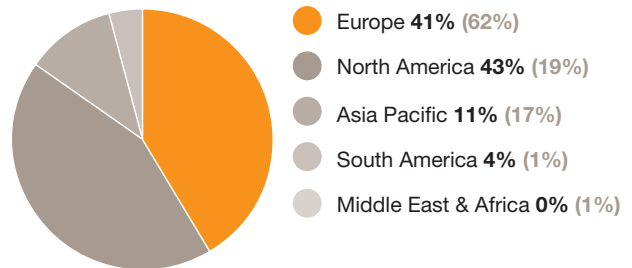
Asia Pacific (incl. Australasia)	2009	2010	% change
Value of deals (US\$m)	7,329	3,563	(51%)
Number of deals	33	64	94%
Average deal value (US\$m)	222	56	

**Figure 10: 2010 deal percentages by continent by value of transactions (2010 total: US\$33,416m)**  
(2009 percentages shown in parenthesis – 2009 total: US\$48,799m)

**By target**

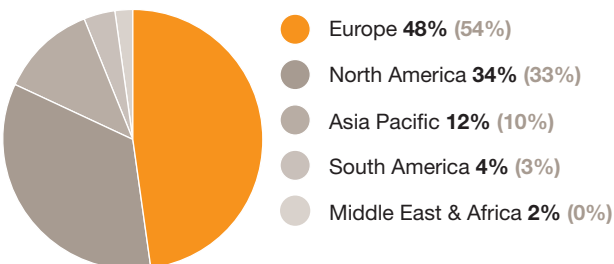


**By bidder**

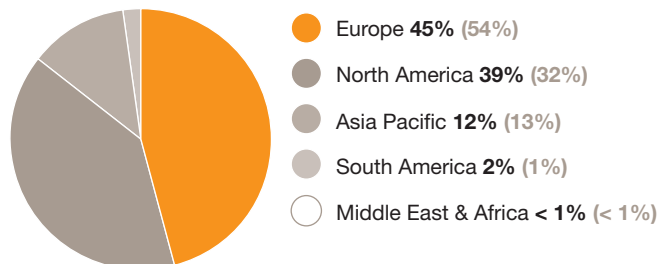


**Figure 11: 2010 deal percentages by continent by number of transactions (2010 total: 530)**  
(2009 percentages shown in parenthesis – 2009 total: 319)

**By target**



**By bidder**



## Deal places: a focus on markets worldwide

# Europe

*Nowhere is the trend toward more deals but lower values more evident than in Europe. Deals for renewables targets in Europe rose 50% year-on-year but total value fell by US\$18bn, down 58% on the previous year's total. Average deal value dropped from US\$181m to US\$51m.*

Subsidy uncertainty has been in the background of the renewables deal environment in some parts of Europe. Governments find themselves having to balance constrained public finances with green energy and energy security priorities. Add to this the falling costs associated with solar installations and they find good reason to introduce reviews of their tariff structures. Germany Spain and Italy have announced plans to cut solar subsidies. In the UK, the government has announced an early review of a feed-in tariff regime that was only introduced in April 2010, which coincides with a review of the support levels for large scale renewable projects.

The changes made by Spanish regulators in December 2010 in relation to the overall remuneration of certain completed projects sent shock-waves through the investor community and claims are likely to be heard in European courts in relation to PV installations. Although the government has underlined its continuing support for reasonable returns to investors, a lack of attention to the impact of changes of control since initial licensing and the functioning of project financing packages has caused concern to secondary investors.

Germany and the UK took over from the Iberian Peninsula as the focus for renewables deal-making in 2010. Together, deals for UK or German assets accounted for well over a third (38%) of European renewables deal value. The focus on the UK and Germany reflects the major expansion of offshore wind power in the North Sea as well as deals in non-offshore assets. Most of this activity, however, was concentrated on smaller deals.

Figure 12: Europe renewables deals by sector – 2010

	By value (US\$m)	% share of total Europe deal value	Number of deals	% share of total Europe deal number
Solar	5,387	41%	89	35%
Wind	4,418	34%	97	38%
Hydro	1,150	9%	8	3%
Energy Efficiency	1,134	9%	34	13%
Biomass	501	4%	18	7%
Biofuels	300	2%	7	3%
Geothermal	155	1%	3	1%
<b>Total</b>	<b>13,045</b>	<b>100%</b>	<b>256</b>	<b>100%</b>

Elsewhere, deals for more established hydro assets continued to contribute to deal flow and, indeed, the largest European deal completed in 2010 was a US\$742m hydropower sale by metals company Elkem in Norway (see 'Deal Makers'). The second biggest European deal saw Iberdrola Renovables acquire the El Andévalo (Huelva) wind farm from Gamesa for US\$440m. The deal falls under the scope of an agreement for the sale of wind farms in Andalusia agreed between Iberdrola Renovables and Gamesa Energía in 2005.

The El Andévalo purchase in early 2010 has since been followed by Iberdrola's further expansion of the installed capacity of the wind complex with the purchase of the 48 MW Los Lirios wind farm from Gamesa. The Los Lirios acquisition takes the overall capacity of the complex to 292 MW, making it the second largest wind site in Europe behind the 322 MW Whitelee farm in Scotland, also owned by Iberdrola Renovables.

Alongside Spain, Italy was a deal hotspot in 2010. Italian deal value was boosted by the Enel Green Energy flotation (see 'Deal Makers') but, also, by a significant level of solar deal activity, spurred by government subsidies for the sector (see commentary in 'deal totals'). Together, Spain and Italy accounted for a fifth of European renewables deal value. The third largest completed European deal came in Spain with the US\$414m purchase of Africana Energia, a 49.9 MW solar power plant project, by construction and engineering group Ortiz.

Renewables deals in Germany and the UK were smaller. One exception, and the remaining European deal in our top ten table (figure 7), was the US\$389m sale by EON of its remaining share of HEAG Südthessische Energie to HEAG Holding. HEAG has significant activities in the renewable energy sector primarily due to its activities as a generator of wind power.

In a deal that remained pending at the close of the year, US independent power producer AES announced a major expansion of its renewables footprint in Europe with an intended US\$175m 51% stake in the 353 MW development pipeline of Polish wind developer Jan Reichert. It follows AES' earlier majority stake in another Polish developer 3E's 422 MW project portfolio and adds to AES Wind's existing European footprint in the UK. The company also has minority stakes in wind developers in France and Bulgaria.

**Figure 13: Europe renewables deals by country - 2010**

	By value (US\$m)	% share of total Europe deal value
Germany	3,582	27%
UK	1,469	11%
Spain	1,410	11%
Italy	1,230	9%
Norway	1,139	9%
France	989	8%
Denmark	472	4%
Switzerland	335	3%
Sweden	328	2%
Malta	305	2%
Other	1,787	14%
<b>Total</b>	<b>13,045</b>	<b>100%</b>

### 2010 review...

...Regulatory reviews have clouded the deal environment in some countries with a particular impasse in Spain between investors and the government...

### 2011 view...

...But, the Spanish changes were not as radical as initially feared and were essentially limited to solar PV installations. Alterations to the regime for concentrating solar power (CSP) and wind were reached by agreement with industry bodies in an overall environment that reflects Spain's continuing support of the renewable industry. In consequence, a significant volume of operational assets were brought to market following the December 2010 announcement.

## Deal places: a focus on markets worldwide

# North America

*North America provided the main focus for renewables deal-making in 2010, with a year-on-year US\$3.9bn rise in target value (up 43%) and an even bigger US\$5.2bn increase in bidder value (up 57%). It now rivals Europe in terms of the total value of deals.*

In the United States, the environment for renewable deal activity has become more favourable. Alongside a recovery in financial markets, a key factor has been the 'stimulus bill', The American Recovery and Reinvestment Act of 2009. An element of multi-year certainty was brought into tax-based incentives, which previously had been subject to doubt due to their yearly expirations. The act also includes a US\$6bn loan guarantee programme for renewable energy and electric transmission technologies, US\$4.5bn for grid modernisation and smart grid implementation, and a number of measures to tighten energy efficiency requirements.

Companies have also been able to take a grant in lieu of investment tax credits which has simplified things for developers by diminishing the need to attract tax equity into projects. However, to earn a grant, the facility had to be placed in service, or construction begun, by the end of 2010 and must be completed within a specified period. In December 2010, these incentives were extended for another year. This spurred a rush of projects which will have had an impact on deal activity as developers seek to sell projects at certain milestones, such as at financial close or the in-service date.

Figure 14: North America renewables deals by sector – 2010

	By value (US\$m)	% share of total North America deal value	Number of deals	% share of total North America deal number
Wind	3,984	31%	35	19%
Energy Efficiency	2,482	19%	52	29%
Solar	2,401	18%	35	19%
Hydro	1,803	14%	10	6%
Biomass	1,172	9%	24	13%
Biofuels	861	7%	18	10%
Geothermal	248	2%	7	4%
<b>Total</b>	<b>12,951</b>	<b>100%</b>	<b>181</b>	<b>100%</b>

Energy efficiency deals are a major growth spot in North America deal-making. They accounted for the largest share of deals in our 2010 analysis – 52 out of 181 deals – and their US\$2.5bn total value accounts for nearly a fifth (19%) of total deal value. Their value just outstrips solar and is second only to the US\$4bn wind sector total. North America has by far the biggest share of worldwide energy efficiency deals – accounting for two thirds of worldwide value (see earlier ‘Energy Efficiency’ section for more commentary).

The largest North American deal, Exelon’s US\$900m purchase of John Deere Renewables (see ‘Deal Makers’) was symbolic of the extent to which the renewables sector has come of age and is now an essential part of mainstream power portfolios. Other key North American deals included large windfarm purchases by ‘infrastructure-type’ investors, including Brookfield Renewable Power Fund in Canada and pipeline operator Enbridge in the US (see ‘Deal Makers’). There were also significant inbound purchases of US solar technology companies by Sharp and Areva (see ‘Deal Totals’).

The largest Canadian deal completed in 2010 was metals company Teck Resource’s US\$729m sale of a one third interest in the Waneta Dam hydro facility to BC Hydro. The deal had been announced the previous year as the miner sought to strengthen its balance sheet following mining purchases made at the height of the commodities boom. In the US, another large deal not discussed elsewhere in this report was power generation company NRG Energy’s US\$350m acquisition of Green Mountain Energy, a retail provider of clean energy products and services. Like the Exelon deal, it highlights moves by generators to expand their renewable energy portfolios.

The low price of gas in the US has cast a shadow on the renewables sector, keeping values down and hindering development. One impact has been as a drag anchor on deal-making in some larger-scale generation assets. For example, Australian wind power producer, and former Babcock & Brown-owned, Infigen Energy has been seeking to sell some of its US assets in order to reallocate capital to its home market. But agreement could not be reached on valuation and the sale was withdrawn.

Another effect of low gas prices has been added pressure for consolidation in the turbine manufacturing sector. In a key deal close to the year end, United Technologies Corporation completed the purchase of California-based Clipper Windpower, in which it already had a 49.9% stake. The turbine market is increasingly dominated by multinational diversified companies such as GE, Siemens and UTC, posing tough competition for independents like Clipper. In contrast, UTC not only has greater market reach and balance sheet strength but is able to leverage expertise in blade technology, turbines and gearbox design gained from activities such as its involvement in Pratt & Whitney aircraft engines and Sikorsky helicopters.

**Figure 15: North America renewables deals by country – 2010**

	By value (US\$m)	% share of total North America deal value
United States	10,360	80%
Canada	2,591	20%
<b>Total</b>	<b>12,951</b>	<b>100%</b>

### 2010 review...

...The gas glut that has arisen from shale gas extraction in the US has dampened the renewables sector in the US...

### 2011 view...

...But even against a background of low gas prices, deal activity has been lively and the outlook looks set for continued deal growth. There is particularly strong growth in the energy efficiency sector which will continue to be spurred by new energy savings targets and codes. North America already has the largest share of energy efficiency M&A, accounting for US\$2.5bn or 65% of the US\$3.8bn worldwide total. Additionally, continued investment in renewable generation projects is necessary to meet level renewable portfolio standards now present in more than 30 states.

## Asia Pacific

*Asia Pacific was again a relatively small contributor to worldwide renewables deal value in 2010, accounting for 12% of all deals in 2010. Like Europe, the strong theme in the region was a bigger volume of deals but for smaller values. Deal numbers nearly doubled but deal value halved (figure 9). However, these totals related to mainstream M&A activity and do not include the substantial flow of IPO activity involving Chinese renewables companies.*

There were a number of Chinese IPOs on the Hong Kong stock exchange in 2010 and the trend is set to continue into 2011. Two of the major Chinese 'gencos' - Huaneng Group and China Datang – planned IPOs of their renewable arms during the year. However, while investor interest has been substantial, the flow has been dogged by market volatility. Huaneng Group decided to cancel its flotation of Huaneng Renewables at the last minute in December 2010. It intends to revive it in 2011.

The Huaneng Renewables flotation was not helped by its timing so close on the heels of China Datang's US\$643m flotation of its renewable power unit. However, like Enel Green Power in Europe, the Datang offer was priced at the lower end of its target range. Earlier in the year, the investment arm of the Hebei provincial government divested natural gas distributor and windfarm operator China Suntien Green Energy in a US\$426m IPO. On the solar front, Trony Solar Holdings held a US\$257m IPO in September 2010.

Chinese wind turbine manufacturers were also active in the IPO market. In October 2010, the largest Chinese renewables IPO saw the US\$1.1bn flotation of China's second-largest wind turbine maker, Xinjiang Goldwind Science & Technology. This was priced at the top of expectations but only after earlier plans had to be shelved in the light of market conditions. Then, early in 2011, its larger rival, Sinovel, came to the China stock market with a US\$1.4bn IPO. Chinese wind turbine companies Sinovel and Xinjiang Goldwind provide formidable competition for western manufacturers such as Vestas, GE and Siemens. The IPO proceeds will enable them to expand their pipelines as well as strengthen R&D as they compete in global markets for the next generation of large 6 MW turbines.

China plans to source 15% of its energy requirements from renewable sources by 2020 and the country's Alternative Energy Plan is encouraging investment in wind, solar and nuclear power. China is the world's biggest exporter of solar cells and western companies have been busy forming manufacturing alliances and, in some cases, conducting M&A. In 2010, this included the purchase of China National Solar by US company National Clean Fuels.

Figure 16: Asia Pacific renewables deals by sector – 2010

	By value (US\$m)	% share of total Asia Pacific deal value	Number of deals	% share of total Asia Pacific deal number
Solar	1,302	36%	20	31%
Wind	1,061	30%	21	33%
Biomass	514	14%	3	5%
Hydro	361	10%	12	18%
Energy Efficiency	136	4%	3	5%
Geothermal	128	4%	3	5%
Biofuels	61	2%	2	3%
<b>Total</b>	<b>3,563</b>	<b>100%</b>	<b>64</b>	<b>100%</b>

In the Chinese wind turbine sector, GE established a minority stake joint venture with Chinese company Harbin Power Equipment to sell wind turbines in China as it seeks to penetrate more deeply into the fast-growing Chinese market. In turn, Harbin is taking a 49% stake in GE's existing Shenyang wind factory, which makes land-based wind turbines.

Japanese companies continue to step up their outbound global presence in the sector. 2010 was notable for being the first year that solar energy-related deals experienced significant growth. The Sogo Shosha, or integrated trading companies, are still leading the trend, but utility companies, such as Eurus Energy and Kyushu Electric Power, and manufacturers, including Sharp and Mitsubishi Heavy Industries, have strengthened their presence in the area (see 'Deal Dialogue' panel).

Australian renewables deal activity was inhibited by a difficult regulatory and market environment, with electricity prices and renewable energy certificate (REC) prices both trading at around A\$35 per MWh. Price expectation gaps have proved to be an obstacle to closing deals for some operational windfarm assets in the case, for example, of Pacific Hydro and the Emu Downs windfarm. In contrast, though, the A\$191m sale of the 70 MW Mt Millar Wind Farm in South Australia by Transfield Services Infrastructure Fund to Meridian Energy was widely seen as achieving a 'full value'.

Investec's stake in the 206 MW Collgar Wind Farm, which is under construction and will be Western Australia's biggest windfarm, was acquired by UBS International Infrastructure Fund (60%) and Retail Employees Superannuation Trust (40%). The project also was the subject of a A\$750m debt-equity project financing transaction with a consortium of five commercial banks (ANZ, National Australia Bank, Westpac, WestLB and the Commonwealth Bank of Australia) and Denmark's export credit agency, Eksport Kredit Fonden.

There is keen interest in investing in the Australian renewables sector, not only from Japanese companies (mainly trading houses and utilities), but now also the Korean and Chinese wind turbine manufacturers. For example, Goldwind of China has entered the Australian market by setting up an Australian office in 2010 and, in a deal which is also believed to involve an equity investment, entered into an agreement with Epuron in February 2011 to supply the 73-turbine Gullen Range Wind Farm in New South Wales.

In the Australian solar sector, the sale of concentrating PV specialist Solar Systems to Silex Systems closed in early 2010. Silex has since announced its intention to raise A\$89m in an institutional placing so that it can expand in the utility scale solar market with pilot plants in Australia and, potentially, the US.

In addition, a key Australian development has been the first significant private equity deal in the country's renewables sector. Greenspark Power Holdings, the bidding vehicle of the Australian private equity firm, Pacific Equity Partners (PEP), acquired a controlling 80% interest in ASX-listed renewable and remote-area energy supplier Energy Developments (EDL).

**Figure 17: Asia Pacific renewables deals by country – 2010**

	By value (US\$m)	% share of total Asia Pacific deal value
China	2,126	60%
Australia	684	19%
India	388	11%
Indonesia	73	2%
Japan	67	2%
Philippines	66	2%
Singapore	55	2%
South Korea	55	2%
Taiwan	26	< 1%
Vietnam	22	< 1%
<b>Total</b>	<b>3,563</b>	<b>100%</b>

## 2010 review...

...The Hong Kong stock market hosted a flow of Chinese renewable IPOs and this is continuing into 2011...

## 2011 view...

...Beijing Jingneng Clean Energy and the solar-glass unit of Xinyi Glass Holding plan to raise a total of roughly US\$1.1bn from Hong Kong IPOs this year, highlighting the rapid growth of demand for renewable energy in China. 2011 is also likely to see the rescheduling of the Huaneng Renewables IPO.

## Looking ahead

*The year ahead looks set to be a busy one with a number of very different deal dynamics arising from the very different stages of maturity of the various technologies within the renewable sector. It is likely that values will continue to be subdued in many territories with, for example, less activity than in earlier years by those utilities companies who are focusing on capital project development. Apart from hydro which has long been cost-competitive in the marketplace, the pattern of investment and deal-making in renewables will continue to be strongly influenced by regulatory incentives.*

A number of governments are weighing up the best way to balance the triple objectives of affordability, security of supply and cleaner energy in a context of tighter public finances. With continuing reviews in countries such as the UK and Germany, there is likely to be a further pause for breath among investors as they wait for clarity on the exact subsidy environment. Part of the challenge for governments is to devise an optimal framework to secure a match between the risk-averse requirements of pension funds and other large institutional investors, that have access to the large pools of capital required to fund capital expenditure on renewable projects, and the risk profile at the development stage of projects.

Governments will be keen to avoid an investment hiatus as they review subsidy frameworks but, nonetheless, this may be inevitable. At the same time, it may prove a spur for deals if some investors judge that the time is right to crystallise existing gains or to recycle capital from lower risk to higher risk assets. Nonetheless, the direction of travel in all the main markets of North America, Europe and Asia Pacific towards cleaner energy and energy efficiency remains clear. For example, the European Union's low carbon roadmap to 2050, launched in March 2011, reaffirmed its target of a 20% cut in carbon emissions by 2010 but also pointed out that a higher target of 25% could be a more cost-effective pathway.

The debate on the balance between renewable energy and nuclear routes to clean energy reopened dramatically in March 2011 in reaction to the nuclear emergency in Japan. As we finalised this report, events were still unfolding at the stricken Fukushima Daiichi power plant. In Germany, Chancellor Angela Merkel was quick to announce a moratorium on an earlier law to extend the life of Germany's nuclear plants. Instead, Germany will re-assess its nuclear policy and has temporarily closed seven reactors. China has suspended approval for new nuclear plants. US Secretary of State Hillary Clinton has said the US has to answer questions about "the costs and the risks" of nuclear power. Whatever their exact outcome, the Fukushima events are likely to shift the energy policy balance towards renewables.

In the US, even before the Japanese earthquake, the deal environment is set for continued renewables deal momentum. An increasing number of states have adopted renewable energy portfolio standards and President Obama's 2011 State of the Union address declared an ambition for 80% of US electricity to come from clean sources by 2035. Momentum for renewable energy will also gain further gradual support as the gas supply overhang begins to abate and natural gas markets begin to tighten, narrowing the cost differential between renewable and traditional sources of power.

On the biofuels front, companies such as BP, Shell, Cosan and Petrobras have been making much of the deal running, centred on Brazil. We expect a similar trend to be played out in Asia, where we anticipate that oil companies and financial investors will once again look at biofuel opportunities. The continued flow of Chinese renewables IPOs on the stock exchange will further add to deal activity in Asia.

Of particular interest will be the extent to which the flow of funds from these flotations will be used as a platform for international expansion by Chinese renewables companies and the extent to which they seek to become regional renewables champions or compete further afield. In Australia, the renewables climate has been clouded by political uncertainty and continued low renewable energy certificate prices. This is placing some constraints on some renewables companies and could result in deal flow as companies seek to divest assets or themselves become targets.

On the solar front, we are beginning to see signs of a take-off in deal-making for larger scale solar power plants as more come on-stream and the market for their construction grows. This is likely to accelerate as the technology matures, scales-up and becomes more cost-effective. US, Japanese and Chinese companies are taking a particular lead in seeking to establish international leadership in this field. On the wider technology front we are also likely to see a further sporadic but, in the long-term, potentially significant drip-feed of deals in emerging renewables technologies such as wave and tidal power.

Energy efficiency has been one of the significant deal stories in 2010 and we expect that deal activity in this sector will continue to expand in 2011, particularly in the US but also in the Middle East and Asia. The sector is at the stage where a wave of companies has come through the angel and venture investment stages to a point where their market and their technology is proven and established. They provide a noteworthy pool of targets for larger companies to purchase and pull that technology into their service offer.

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