

19 July 2012

Q2 2012 CLEAN ENERGY POLICY & MARKET BRIEFING

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Clean Energy
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Small solar plays big role in sustaining Q2 investment

New clean energy investment rebounded 24% to \$56bn in Q2 2012 from an abysmal first quarter of the year, thanks largely to the growing market for small-scale photovoltaic (PV) systems. Plummeting renewable energy equipment costs showed signs of stabilising, at least temporarily, for the first time in several years. And policy-makers in the EU continued scaling back subsidies just as their counterparts in Japan were stepping up support for the sector. In this second edition of the Clean Energy Policy & Market Briefing, Bloomberg New Energy Finance highlights Q2 2012's key trends and policy developments.

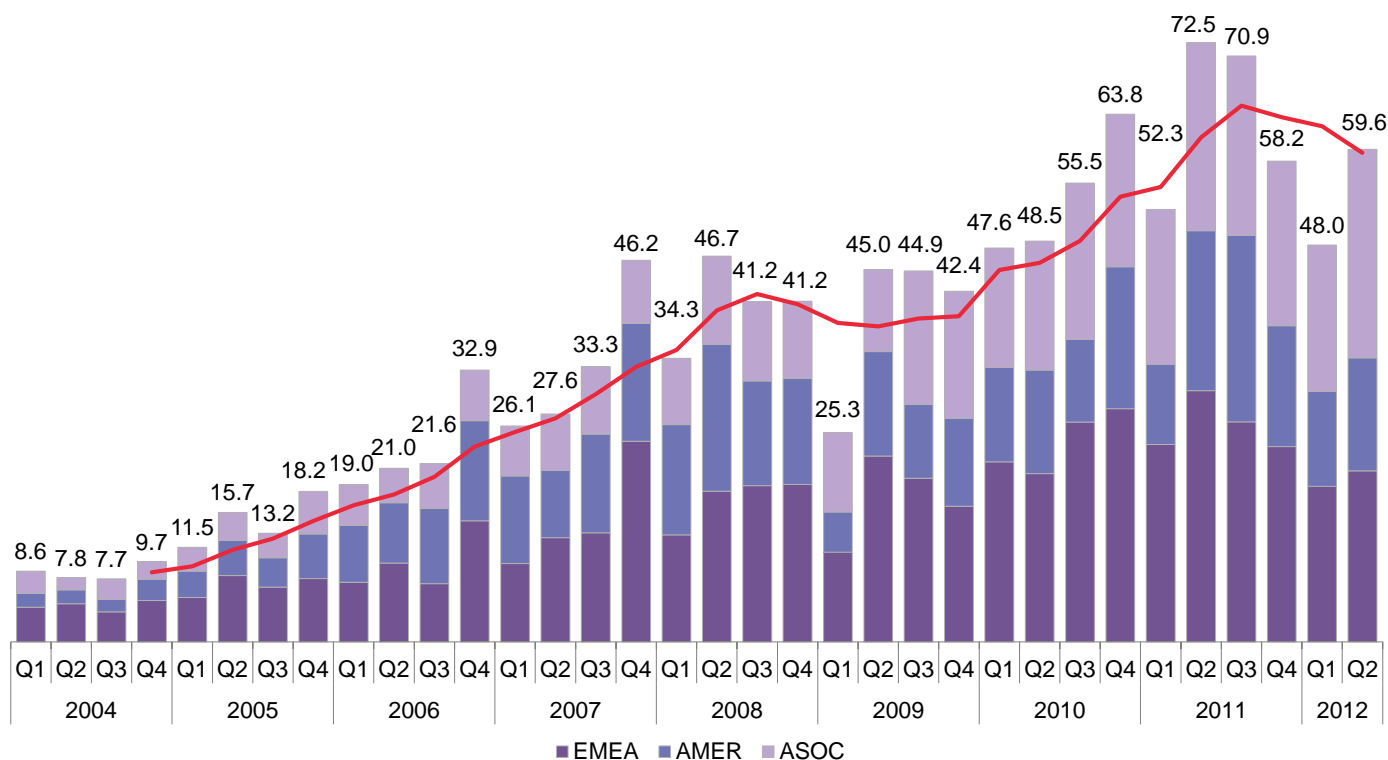
- Q2 2012 clean energy investment showed resilience in the face of global economic uncertainty and declining policy support in Europe. Overall investment rose 24% from Q1 to \$56bn but was off 18% compared to the near-record quarterly figure of \$72.5bn in Q2 2011.
- China (\$18.3bn) contributed most to the bounce, while the Americas outside the US also surged to attract \$2.9bn in new financings. There was a clear split between investment in clean energy companies – which was depressed in Q2 – and project investment, which held up well.
- Among the various clean energy sub-sectors, solar accounted for the majority of new funds invested with \$33.6bn, up 19% from the prior quarter. This reflected continuing growth in new small-scale system installations. Wind accounted for \$21.6bn of investment in Q2, up 47% on Q1.
- Public markets investment in clean energy was weak, at just \$1.2bn in Q2. The sector's continuing challenges were highlighted by a 15% quarterly retreat in the WilderHill New Energy Global Innovation Index (NEX) which touched a nine-year low during the period.
- Key European nations took steps to rationalise their support for the sector in the face of dropping equipment prices and tight fiscal conditions. Italy announced a move to hold reverse auctions for power contracts from onshore wind projects and cut its feed-in tariff (FiT) support for PV; Germany cut its PV FiT; and the UK introduced a new bill to move away from its green certificate scheme to a feed-in premium, with competitive price-setting later this decade.
- Japan introduced an aggressive FiT programme on 1 July covering biomass, geothermal, small hydro, solar and wind. The programme also provides opportunities for small- and micro-scale applications, such as wind projects smaller than 20kW in capacity and hydro projects below 200kW.
- Trade tensions between nations continue to mount. The US is moving toward finalising import duties on solar cells and modules from China and wind-turbine towers from China and Vietnam. There are calls for similar action on PV imports in Europe.
- Both solar and wind equipment manufacturers are experiencing a period of market consolidation in the face of falling prices and compressed margins. Up to 20GW of solar cell manufacturing capacity could be off the market shortly as manufacturers scale back production or even enter bankruptcy. Declining wind turbine prices will force smaller suppliers without the relevant scale or technology to exit the market.

1. INVESTMENT

The clean energy sector showed resilience in the face of global economic ills and policy uncertainty in the second quarter of 2012, with new investment totalling \$59.6bn. This was up 24% on Q1, but down 18% compared to the near-record quarterly figure of \$72.5bn in Q2 last year. This quarter's figures show a clear split between investment in clean energy companies, which was depressed in Q2 in the face of world economic and stock market troubles and project investment, which held up well. (Please note: this is the first quarter in which Bloomberg New Energy Finance has published an estimate for small-scale project investment. Previously we only published annual numbers for these investments. The only difference between the new quarterly series and the annual totals is that the latter also include government and corporate research and development spending on clean energy.)

China saw a surge in investment to \$18.3bn in the April-to-June period, up 92% from the previous three months, with several large PV and wind projects each clinching hundreds of millions of dollars in financing. Europe and the US also enjoyed solid gains in investment in Q2, while non-US nations in the Americas saw a sharper increase, of 56% to \$2.9bn. Overall, solar accounted for \$33.6bn of investment in Q2, up 19% on Q1, and wind \$21.6bn, up 47%.

Figure 1: New financial investment in clean energy by geographic region, Q1 2004-2 2012 (\$bn)



Source: Bloomberg New Energy Finance. Note: Red line represents the four quarter trailing average investment. Figures include asset finance (financing of large-scale power-generating projects), public markets (funds raised over the stock markets), venture capital and private equity (financing for primarily private companies from private investors), and funding for small-scale renewable power generation (mainly residential or small commercial photovoltaic systems). Excludes corporate and government R&D. Figures adjusted for re-invested equity.

Among the smaller clean energy sectors, biomass and waste-to-power recorded investment of \$1.4bn in Q2, down 22% from the first quarter. Biofuels saw a 12% fall in investment to \$750m. Small hydro project investment slipped 30% to \$1.1bn. Energy-smart technologies, such as smart grid and advanced transportation, showed a 74% rise to \$1.1bn but remained down on the equivalent quarter last year.

1.1. Asset finance and venture capital/private equity

Venture capital and private equity investment was also subdued, at \$1.5bn in Q2, down 28% from Q1 2012 and 39% from the Q2 2011. Asset finance of utility-scale renewable power and fuel projects, however, rebounded 50% in the April-to-June quarter, reaching \$35.9bn. This helped to lift the overall investment figure for the period.

Figure 2: Global asset finance for new-build clean energy projects, Q1 2004–Q2 2012 (\$bn)

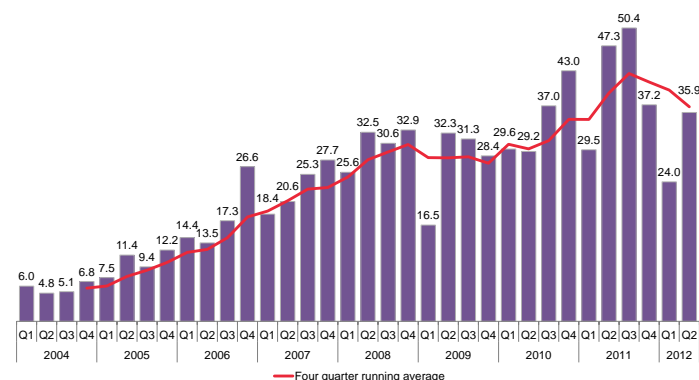
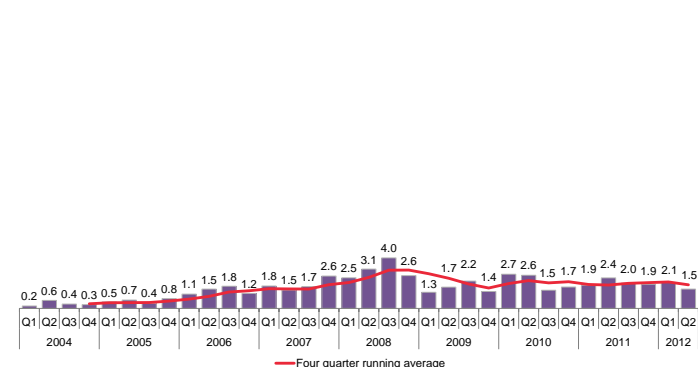


Figure 3: Global venture capital and private equity investment in clean energy, Q1 2004–Q2 2012 (\$bn)



Source: Bloomberg New Energy Finance. Note: Total values include estimates for undisclosed deals. Figures from prior periods have been revised to reflect new data. Small distributed capacity excluded.

Source: Bloomberg New Energy Finance. Note: Total values include estimates for undisclosed deals. Figures from prior periods have been revised to reflect new data.

Among the largest projects financed in the second quarter of this year were the 270MW Lincs offshore wind farm, off the UK coast, for \$1.6bn; the 419MW Flat Ridge Wind Farm phase two in the US, for \$800m; and the 250MW Guodian Shanxi Qinyuan Taiyue Wind Farm phase two in China, for \$317m. The largest Chinese solar project financed was the Shanlu & Shengyu Bayannur Wuyuan PV plant, at \$316m.

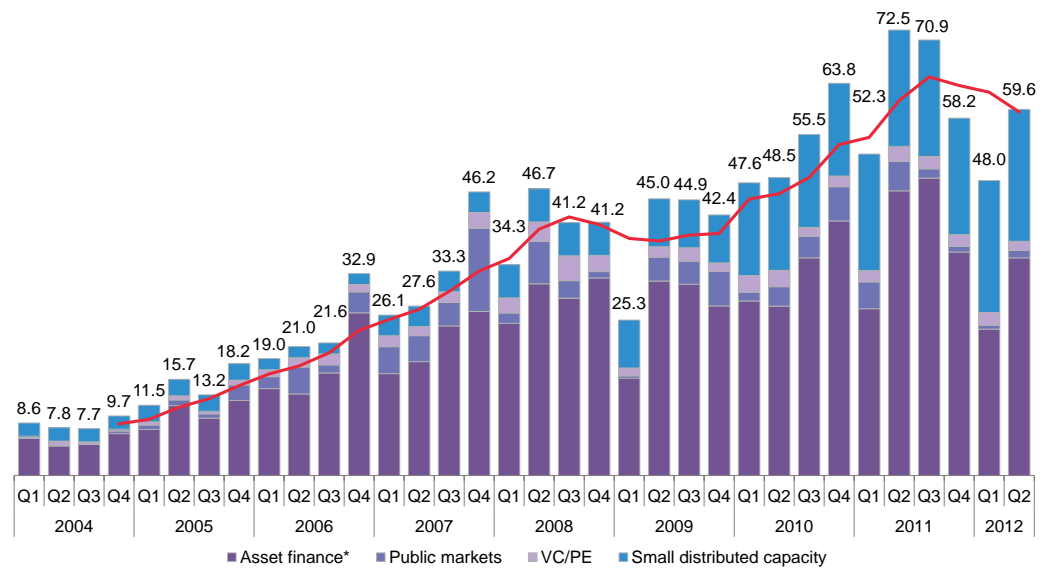
The largest venture capital and private equity deals of the quarter saw Fisker Automotive of the US clinch \$148m for its plug-in hybrid vehicle development, and Sapphire Energy, also of the US, secure \$144m for its algae-based biofuel business.

1.2. Small-scale financings

The rapid decline in PV equipment prices combined with generous subsidy programmes has spurred significant growth in the market for rooftop solar over the last several years. To reflect the importance of these projects and financings, Bloomberg New Energy Finance now includes estimates for investments in this area in our quarterly figures.

Our estimates suggest that small-scale projects 1MW in size or smaller attracted \$21.5bn in new investment in Q2, 13% more than they did in the same quarter last year. Germany and Italy remain very important, but small-scale PV is now broadening its geographic base, with markets in the US, Japan and China all growing rapidly.

Figure 4: Clean energy financings by asset class Q1 2004-Q2 2012 (\$bn)



The NEX retreated 15.5% in the second quarter of 2012, severely underperforming broader market indexes that also sank amid global concerns over government deficits in the West and slowing growth in Asia

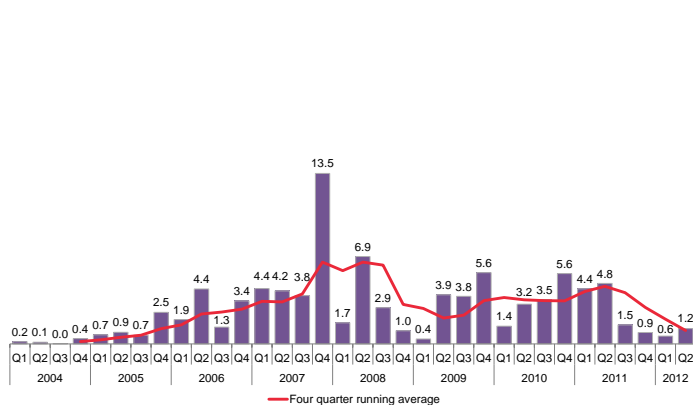
Source: Bloomberg New Energy Finance. Note: Small distributed capacity category consists primarily of financings for small-scale residential or commercial PV systems. Red line indicates trailing four-quarter average investment level.

1.3. Public markets

The continuing challenge for companies hoping to raise capital over the public stock exchanges to support expansion was highlighted by a fresh 15% fall in the WilderHill New Energy Global Innovation Index, or NEX, which tracks 96 clean energy stocks worldwide. At the end of Q2, the NEX was 75% below its record high posted in November 2007. At one point during the quarter, the NEX hit a nine-year low.

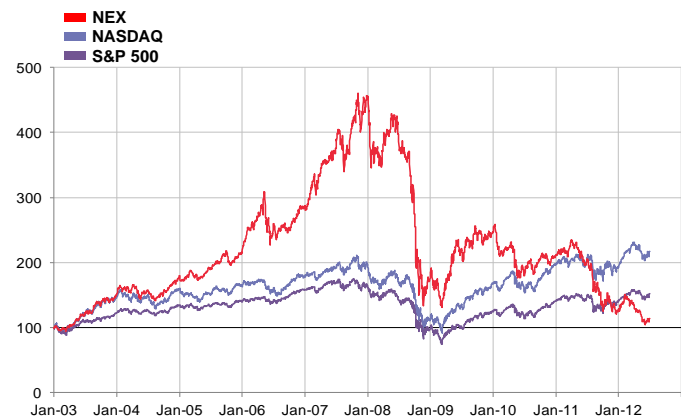
Not surprisingly, public markets fundraising for clean energy was weak in the period, totalling just \$1.2bn. This was nearly double the rock-bottom Q1 figure, but 75% below that for the second quarter of 2011. The largest public market deal was a \$340m initial public offering by Chinese solar water heater company Jiangsu Sunrain Solar Energy. Other significant deals included HC SemiTek Corp's IPO of \$157m and Shenzhen Jiawei Photovoltaic Lighting's IPO of \$61m.

Figure 5: Global public market new investment in clean energy, Q1 2004-Q2 2012 (\$bn)



Source: Bloomberg New Energy Finance.

Figure 6: WilderHill Global New Energy Innovation Index (NEX) performance, 2003-12 YTD



Source: Bloomberg New Energy Finance. Note: Values as of 1 July 2012; NASDAQ and S&P 500 rebased to 100 on 01 Jan 2003.

The NEX closed out the quarter on a mildly positive note by rising 1.2% in its final trading week. Still, the global basket of clean energy stocks finished the first half down 11.5% versus a 4.7% decline in the same period of 2011.

2. POLICY

Falling clean energy equipment costs and fiscal belt tightening continued to play a critical role in policy development in Q2 2012. Solar subsidies once again took centre stage, with governments from Europe to China reducing per-kilowatt hour subsidies in an effort to better align with falling system costs. Still, PV subsidies are unlikely to disappear anytime soon. Japan filled in the details on its new feed-in tariff regime in Q2, granting generous support for PV in particular. Poland has proposed higher support than previously granted and Brazil approved tax incentives for the technology.

Trade tensions between nations over clean energy continue to build. The US government is moving toward finalising import duties on solar cells and modules from China and wind turbine towers from China and Vietnam. And there are calls for similar action in Europe, where German PV equipment maker SolarWorld is expected to lead a coalition of European solar manufacturers in a new complaint with the European Commission against products from China.

Voters in Italy, France and Greece backed parties – from far left to far right – vowing to avert or lessen the budget-tightening agreed to in the course of last year. The governments are thus looking for tax revenues and spending cuts in the areas less sensitive to voters. New electricity taxes covering renewables and thermal generation alike are being proposed, particularly by the most troubled economies. Last quarter also saw tariff reductions in Germany and Italy, following changes in the UK and Spain earlier this year. These actions should limit power price increases and better align the subsidies with falling technology costs.

2.1. CLEAN ENERGY TRADE TENSIONS

Trade tensions between nations over the cross-border flows of clean energy ratcheted up in Q2, with the main flashpoint between the US and China. Following a complaint by a solar industry coalition led by the US subsidiary of SolarWorld in 2011, the US set preliminary countervailing duties in March and anti-dumping duties in May that together could make Chinese solar panels around 27% more expensive in the US market. The US in May also applied preliminary countervailing duties on wind towers produced in China in response to a complaint from US manufacturers. Preliminary anti-dumping duties on wind towers from China and Vietnam could be released in late July with final determinations made this autumn.

The spat could move to the World Trade Organization (WTO) as China at the end of May requested consultations on US duties on a range of Chinese products, including solar panels and wind towers. There is a mandatory 60-day consultation period between the two countries before China could ask a WTO dispute settlement panel to investigate. Meanwhile, at the end of June, the EU, US and Japan requested a WTO panel to be formed to rule on their complaints over China's export restrictions on rare earth materials. China produces over 95% of the world's rare earths, which are essential for advanced electronics including electric vehicles and wind turbines.

The next major WTO judgement concerning clean energy could come this autumn, when a panel is expected to rule on the legality of Ontario's feed-in tariff scheme. The judgement would come in response to a complaint brought by Japan and the EU that questioned Ontario's local content manufacturing requirements for solar and wind projects.

2.2. AMER

In the **US**, the Department of Energy announced it had delivered \$1.6bn in stimulus funding for clean energy and energy efficiency in the quarter ending 30 June. The large majority of that, about \$934m,

The US has set preliminary duties on Chinese solar panels and wind towers

Some \$1.6bn in the US stimulus funding for clean energy and energy efficiency was delivered in the quarter

flowed to energy conservation and smart grid programmes. Another \$126m went to credit subsidies under the federal '1705' loan guarantee scheme.

The US federal government and multiple states and agencies agreed to collaborate on streamlining the permitting process for offshore wind projects in the Great Lakes region. Finally, the US has initiated an effort to develop advanced drop-in biofuels for use by the US Navy and Air Force. The effort relies on existing funding authority of the departments of energy and agriculture and the Pentagon. The effort is proceeding despite attempts in both houses of Congress to block the spending or condition it on the production of advanced biofuels that do not exceed conventional fossil fuels on price.

Tax Credit Uncertainty Poised to Hurt US Wind in 2013

Wind development in the US continued apace in the second quarter as the country builds toward a record year prior to the 31 December expiration of the \$0.022/kWh federal Production Tax Credit (PTC). More than 2GW of projects were financed in the quarter, and Bloomberg New Energy Finance has raised its new-build projection to 11.2GW for the year.

A major fall off in new build is certain in 2013, however, and the decline will be even sharper if the US fails to extend the PTC into the coming calendar year. With no PTC, new build for wind will fall to between 1-2GW in 2013, Bloomberg New Energy Finance forecasts. Should an extension come after the 6 November national elections but before the end of this year, 2013 new-build could total 4-6GW and that figure will be bolstered by some projects that come online in 2013 instead of 2012 once the threat of PTC expiration is removed.

Brazil in April approved the exemption of the state-level value-added tax for small hydro equipment in two southern states: Rio Grande do Sul and Paraná. In June, there was a 16.8% reduction in two federal taxes used to fund Brazil's social security programme for the sale and import of biodiesel.

Brazil's Agência Nacional de Energia Elétrica (ANEEL) approved a proposal for tax reductions for net metering and for transmission (TUST) and distribution (TUSD) for solar projects. Still, the National Congress has not yet passed them into law. The solar regulation will offer an 80% reduction of TUST and TUSD taxes to solar projects with capacity equal to or above 30MW for the first 10 years of operation if they are commissioned prior to 2017. Currently, all other renewable technologies enjoy a 50% TUST and TUSD tax discount.

Mexico announced greenhouse gas reduction targets of 30% by 2020 and 50% by 2050, against a baseline of emissions in 2000. To reach the targets, Latin America's second largest economy will establish a voluntary emissions trading scheme, a national emissions inventory and a climate change fund to support mitigation activities.

Costa Rica joined the club of Latin American countries that issues long-term power purchase agreements for clean energy projects via government-sponsored auctions. This policy mechanism was implemented as a step to help the Central American country reach its carbon neutrality target by 2021. In June, Instituto Costarricense de Eletricidad (ICE), the public vertically integrated utility, announced the tender of 100MW of wind and 40MW of small hydro contracts.

Both **Chile** and **El Salvador** released their national energy plans, with special focus on renewables and energy efficiency.

2.3. ASOC

Australia's carbon mechanism commenced operation on 1 July. The scheme covers 62% of the nation's emissions and began with a fixed price of AUD 23/tCO₂e that rises by 2.5% in real terms annually before transitioning to full emissions trading on 1 July 2015. The quarter also saw lawmakers passing bills to create the AUD 10bn Clean Energy Finance Corporation (see box below).

Mexico announced greenhouse gas reduction targets of 30% by 2020 and 50% by 2050

Australia's carbon pricing mechanism kicked off on 1 July

Meanwhile, the federal government's AUD 1.5bn Solar Flagships programme has struggled to achieve its objectives of demonstrating 1GW of large-scale PV and solar thermal capacity. The first two projects sponsored failed to achieve financial close, and now only one 159MW PV project appears to be on track for completion in 2015, Bloomberg New Energy Finance projects.

Australia's Clean Energy Finance Corporation

In July, the Australian government legislated an AUD 10bn (\$9.9bn) Clean Energy Finance Corporation (CEFC) – an independent, government funded 'green investment bank' designed to support the commercialisation and deployment of renewable energy, energy efficiency and low-emission technologies in Australia.

The CEFC will have AUD 2bn per annum available over five years starting from 1 July 2013, when it is scheduled to commence investing. The Corporation will operate with a higher appetite for risk and a lower expectation for return than a commercial bank. Its aim is to de-risk the capital structure of projects and businesses with government funds so that private co-investment can be secured. Unlike the European Investment Bank or the proposed UK Green Investment Bank, it will lend only its capital and will not be able to raise money in the bond markets.

In **New Zealand**, the government has prepared amendments to the nation's emissions trading scheme to be considered in parliament in the coming months. Major changes include delaying the inclusion of the agricultural sector, subject to a review in 2015; extension of the transition measures which allow one emissions unit to be surrendered against two tonnes of emissions; and the fixed price option to remain fixed at NZD 25/tCO₂e. No end date has been given for the transitory measures.

On 2 May, **South Korea's** National Assembly passed a bill to establish an emissions cap-and-trade system by 2015. The government must now work out the specifics of the programme, including its link to the international offset market. Participants are due to receive between 95% and 100% of their compliance obligation as free allocation with the goal of minimising the cost to industry. Bloomberg New Energy Finance anticipates South Korea will contribute to long-term demand for certified emission reductions – rising to around 129Mt in 2020 – and potentially link with other markets.

New feed-in tariffs in Japan

Japan introduced a FiT programme on 1 July 2012. The programme covers biomass, geothermal, solar, wind, and small-hydro projects. It also provides unique opportunities for small- and micro-scale applications such as micro-wind (below 20kW in size) and hydro projects smaller than 200kW, plus residential-scale solar PV which has been covered by a PV power buyback scheme since 2009.

The government determined rates based on its own cost assumptions and pre-tax project return expectations. The resulting, very generous regime has been set for the first nine months of the programme lasting from July 2012 through March 2013. Developers are eligible for the high FiT rates so long as their project receives government accreditation and signs a power purchase agreement with a utility before the end of Q1 2013. From April 2013, rates are due to be revised annually or halfway through the year if the energy and trade minister deems it necessary.

Given other countries' experience with FiTs and the high rates set locally by regulators in Japan, Bloomberg New Energy Finance anticipates a boom in solar installations. This, in turn, could prompt policy-makers to reduce rates.

South Korea passed a bill to establish a cap-and-trade system by 2015

China raised its solar energy target to 21GW by 2015 from 15GW but the Golden Sun subsidy level was cut

The **Chinese** government raised its solar energy target from 15GW to 21GW by 2015. This move is viewed as an attempt to help absorb excess domestic manufacturing capacity. The draft of a renewable energy portfolio standard proposing minimum clean energy consumption levels by 2015 has also been released. Power companies have targets for non-hydro renewable electricity generation. Meanwhile, grid operators and provinces will be expected to meet certain clean energy consumption targets.

The other important development during the quarter was the reduction of the subsidy level for Golden Sun projects by 21% to CNY 5.5/W from CNY 7/W last year. The list of 1.7GW Golden Sun projects eligible for government subsidy has also been released.

While there were no major policy announcements out of **India** during the quarter, policy-makers there have been laying the groundwork for significant announcements in Q3. There are now indications that accelerated depreciation benefits and the generation-based incentives for wind power could be reinstated. There is also the possibility of higher FIT rates for wind in four Indian states.

Back at the federal level, penalties were imposed in Q2 for the first time on projects that failed to meet timelines set under the National Solar Mission, which aims to bring 3GW online by 2017. Bidding guidelines for the next phase of the Mission could be announced in Q3.

In **Saudi Arabia**, the King Abdullah City for Atomic and Renewable Energy unveiled a two-stage plan to spur clean energy deployment in May. The first phase will involve reverse auctions to award power contracts representing 6.6GW of potential capacity from wind and solar projects. The tenders in phase one will be held in two rounds, with the second round including a local procurement requirement. The second phase would involve a feed-in tariff to subsidise further development.

2.4. EMEA

The **UK** unveiled a draft new Energy Bill in May for the country's comprehensive Electricity Market Reform, which will replace the green certificate support scheme with a feed-in premium – set competitively later this decade – and introduce a new capacity market. The bill also set out interim 'enabling agreements' to spur new nuclear and offshore wind investment. FIT cuts for small-scale PV which had been resisted by industry were pushed back from July to August. The UK also made progress on ambitious plans for electricity interconnections with Ireland, Iceland and Norway.

FITs were suspended entirely in **Spain** earlier this year but the country still holds promise for solar development, given the available local natural resource and record low PV equipment prices. In Q2, Solaria Energia Medio Ambiente said it is planning a 150MW PV project that could be the country's first to be built essentially subsidy-free.

Seeking new revenues to address its fiscal situation, the Spanish government has proposed a major hike in its electricity tax rate. Reported proposals include an increase from the current EUR 0.5/MWh to EUR 5/MWh. The move would most likely affect renewable and non-renewable electricity generation alike. The tax will be agreed before the Spanish cabinet's summer recess on 27 July.

After a six-month delay, the **Italian** government published a new Renewable Energy Decree on 13 April stipulating that reverse auctions will replace its green certificate support for large-scale onshore wind projects. The auctions have been designed to ensure only economically viable submissions by setting minimum levels for opening and final bids.

The decree was soon followed by the publication of the fifth *Conto Energia*, setting FITs for PV projects from H2 2012. The scheme, approved on 6 July, introduces feed-in tariff cuts averaging 39-43% starting 27 August. As well as lower support levels, overall outlay for most installations will be limited by a set budget every six months. There will be EUR 140m available for the first half-a-year period, EUR 120m for the second and EUR 80m thereafter.

At the end of May, **Poland** revealed further clarifications to its Renewable Energy Act, which was first proposed in December 2011, and has been undergoing public and inter-ministerial consultations

India's accelerated depreciation benefit and the generation-based incentives for wind power may be reinstated soon

Despite a lack of subsidies, Spain could see further solar development, thanks to exceptional natural resources and lower equipment costs

since. The proposed document introduces technology banding to Poland's hitherto technology-neutral green certificate scheme. The banding levels, eagerly awaited by the industry, revealed higher than previously proposed support for onshore wind, making it eligible for 0.9 certificates per MWh instead of the 0.75 suggested in December. The latest announcements also included 2.85 cert/MWh for solar installations in 2013-14. Given the current PLN 264 (EUR 62.8) value of Polish green certificates, PV projects there could receive some EUR 179 per MWh in 2013-14 under the new scheme, making Poland an attractive market for installers.

German policy-makers had a busy quarter. First, an earlier decision to cut solar FiTs by 20-29% from 1 April 2012 was challenged by state leaders and referred to an arbitration panel of the Bundesrat. A compromise was reached only in the last week of June. The cuts will be upheld but a new category for PV projects of 10-40kW capacity was introduced with a feed-in tariff set at EUR 0.185/kWh, higher than the EUR 0.165/kWh available for larger projects (up to 1MW). The decision also introduced an overall cap of 52GW, after which the subsidy for PV will be terminated.

Following the delays in offshore wind project connections, Germany's ministries of environment and economy jointly proposed a new liability regulation. The proposal grants compensation to projects affected by connection delays and transmission interruptions. When passed, this regulation will address one of the biggest investment barriers for offshore wind.

Market integration of German renewables

The percentage of renewable power fed into European grids has steadily risen over the last few years and the trend is set to continue as EU member states race to achieve their 2020 targets. Governments across Europe are designing mechanisms to ensure better integration of renewables with power markets and to better align their support with falling system costs.

Germany, for instance, introduced a market premium for renewable generators in January 2012 as an alternative to its established FiTs. The optional premium is linked to, and paid in addition to, traded power prices and complemented with a "management fee" to cover transaction costs associated with switching schemes. This makes the scheme more attractive than the feed-in tariffs and the rates are set for each technology. The programme's uptake in the first six months of this year exceeded policy-makers' expectations, with 70% of onshore wind, 30% of biomass and hydro and 4% of PV installations choosing the premium over the FiT. This resulted in a EUR 200m cost and the "management fees" are now all but certain to be reduced. Yet again, legislators in Germany have set the rates too high but the example shows that bringing renewables closer to electricity markets is not impossible.

The **European Parliament, Commission and Council** struck a deal over the new EU Energy Efficiency Directive in June, which establishes the third pillar of the EU's 2020 climate and energy strategy. While the bloc's energy consumption goals are enumerated, unlike the targets for emissions reductions and renewable energy they are not specified for each country and will not be legally binding. Rather, EU countries will come up with their own targets, as well as national plans to meet them. These will include a 1.5% annual energy saving obligation on energy companies, and roadmaps for nationwide building renovations. The EED needs to be approved by the European Parliament but, after months of negotiations, no further changes are anticipated.

On 21 May 2012, **South Africa** awarded preferred-bidder status to 19 renewable energy projects, totalling roughly 1GW of capacity and estimated to cost ZAR 28bn (\$3.4bn). The selected "preferred bidders" had until 19 June to close all contractual arrangements including power purchase agreements. This deadline has since been extended twice. Once this is completed and project financing secured, the bidders can start construction. This was the second bidding round under the country's renewable energy independent power producer procurement programme, the first of which saw approximately 1.4GW awarded preferred-bidder status in December 2011.

South Africa awarded preferred-bidder status to 19 renewable energy projects, totalling roughly 1GW

3. TECHNOLOGY

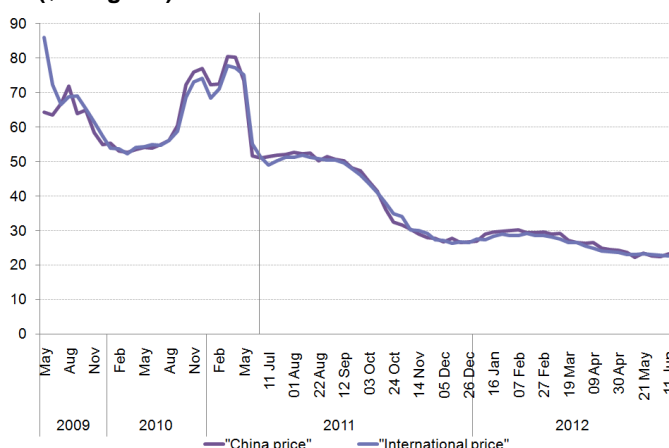
A general supply glut continues to prevail across multiple clean energy sectors. While these conditions are squeezing manufacturers' profit margins and hurting their valuations (see Section 1.3 above), they are also reducing clean energy system costs for consumers to unprecedentedly low levels.

3.1. Photovoltaic prices sink slightly, consolidation continues apace

The consolidation of solar manufacturers continues as prices bump along at the marginal manufacturing cost of \$0.85-0.90/W for modules. Equipment makers Abound Solar (US) and Centrotherm (Germany) filed for bankruptcy. General Electric (US) pulled back from previously announced plans to expand manufacturing and Schott (Germany) exited the market. Bosch Group (Germany) hinted that without import tariffs on Chinese-made modules its German solar subsidiaries may close. All in all, about 20GW of cell manufacturing capacity is or will shortly be off the market.

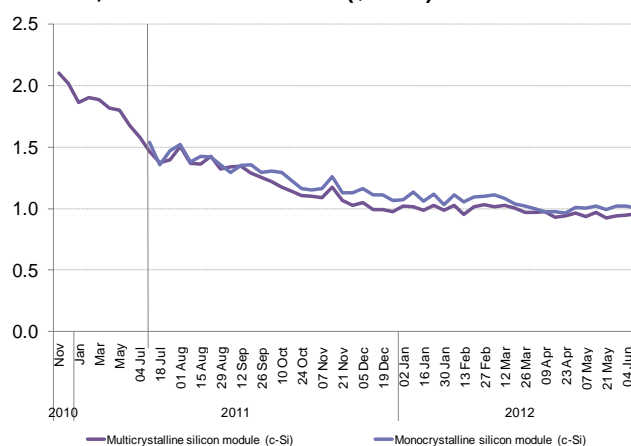
Despite stronger than anticipated demand in Europe during the first half of the year, prices for all segments of the value chain except modules fell slightly. In June the Bloomberg New Energy Finance "China price" for solar-grade silicon averaged \$23.1/kg while the "international price" (everywhere but China) was \$22.6/kg (Figure 8). The polysilicon spot market appears to have stabilised at \$22-23/kg, but has not risen despite the increased demand some module manufacturers have faced, mainly from Germany.

Figure 8: Spot price of solar-grade silicon, May 2009-June 2012 (\$/kilogram)



Source: Bloomberg New Energy Finance. Note: Average of all prices submitted to Bloomberg New Energy Finance survey. From 11 July 2011 the Index was conducted weekly. Dates in chart represent first day of the week over which the price has been averaged – ie, 8 August represents average for the week 8-14 August.

Figure 9: Price for immediate delivery of crystalline silicon modules, Nov 2010-June 2012 (\$/Watt)



Source: Bloomberg New Energy Finance. Note: From 11 July 2011 the Index was conducted weekly. Dates in chart represent first day of the week over which the price has been averaged. Prior to the weekly updates, the Index collected price of c-Si modules without differentiating between mono and multi crystalline silicon technology.

3.2. Wind turbine prices

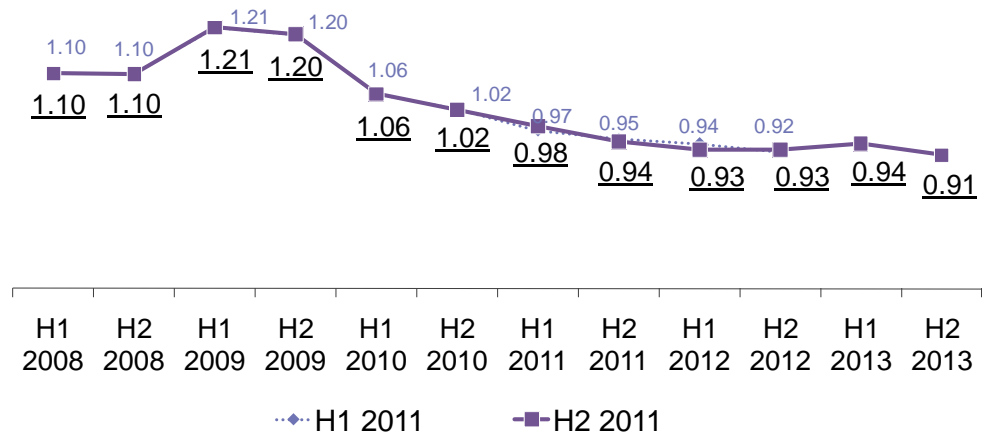
Policy uncertainty and higher financing costs, especially in Europe, are translating into lower growth prospects in 2013-14. The US, in particular, is due to see a significant fall in installations due partly to the expiration of the federal Production Tax Credit, while both India and China will also experience lower demand, due to phased out tax incentives and grid constraints respectively. In Europe, Spain will only display marginal growth after abandoning subsidies in January this year.

Lower growth in the Chinese market will force local suppliers to offload their excess capacity in foreign markets, increasing competition for orders and leading to lower turbine prices. In such a context the industry is likely to experience some consolidation. Smaller suppliers without the relevant scale or technology, or those without a strong balance sheet, will be forced to exit the market. Well capitalised

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institutional investors and Asian players, on the other hand, are also actively acquiring assets from distressed project developers and utilities.

Figure 10: Wind Turbine Price Index mean price by date of delivery H1 2008-H2 2012 (EUR/MW)



Source: Bloomberg New Energy Finance. Note: "H1 2011" indicates where prices were estimated to be the last time Bloomberg New Energy Finance conducted its survey of buyers and sellers of turbines in the first half of 2011. Contract prices include turbine plus towers and transport to site, and they exclude VAT. Asian turbine contracts have been excluded from the analysis as they have much lower pricing.

3.3. Electric vehicle charging infrastructure

Total investment in public electric vehicle (EV) infrastructure hit an estimated \$437m in 2011 and Bloomberg New Energy Finance projects this to rise steeply to \$1.7bn in 2013. The vast majority of the investment to date has come from governments as countries aim to accelerate EV adoption. For public infrastructure, fast charging is becoming much more important as it offers a service that EV users cannot get at home, and enables driving range to be extended for longer journeys, helping to relieve range anxiety.

Figure 7: Public EV charging point deployment (AC), 2009-13e (Units)

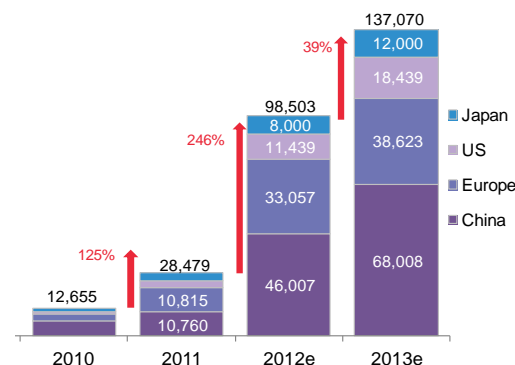
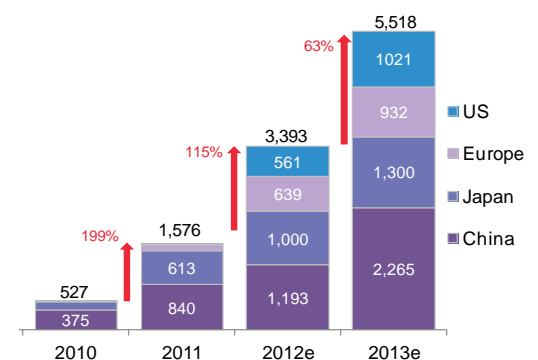


Figure 8: Public EV fast charging point deployment (DC), 2009-13e (Units)



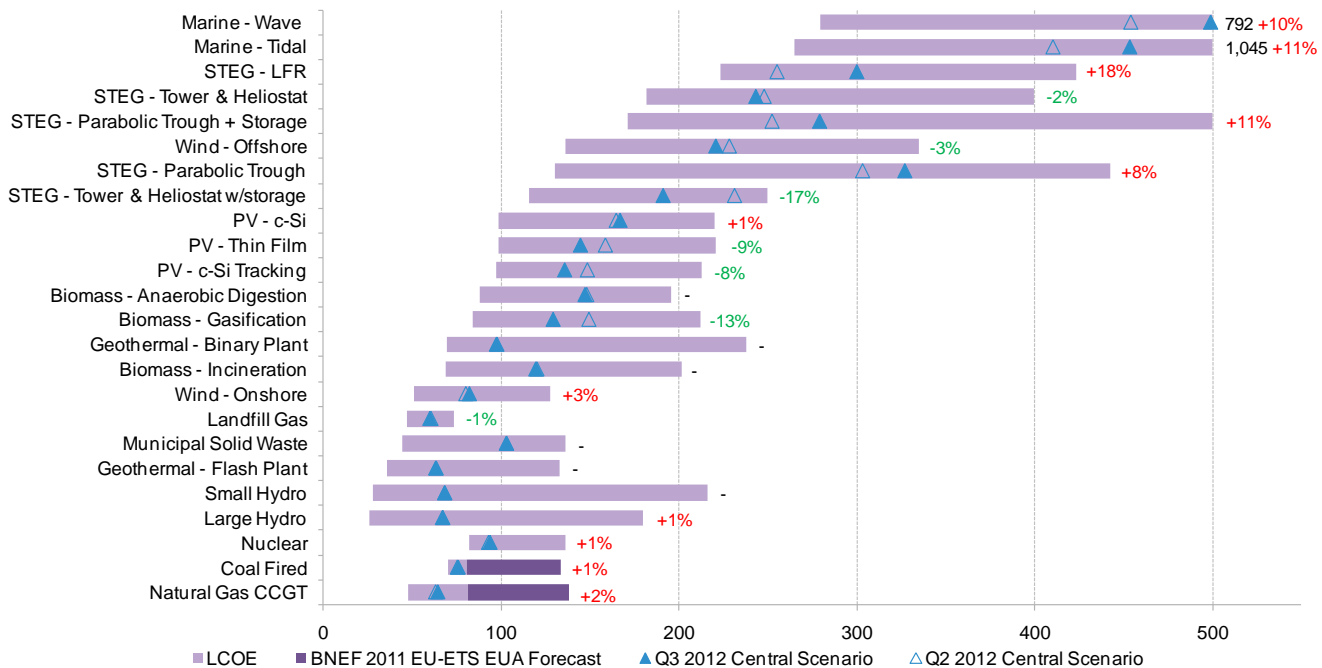
Source: Bloomberg New Energy Finance. Note: For ease of display, Israel is here included in Europe.

3.4. Levelised cost of electricity

The levelised cost of electricity (LCOE) of a given technology represents the price at which a project owner can sell power and earn an acceptable return on his original investment. Each quarter, Bloomberg New Energy Finance examines the LCOEs of all the major clean energy technologies to

understand how competitive each is with its fossil fuel rivals on something close to an apples-to-apples basis. The LCOE is determined almost entirely by two factors: the cost of the equipment needed for a clean energy project and the cost of the capital needed to finance that project. (Marginal costs are minor since the fuel – the wind, sun, sub-surface heat for geothermal, etc. – is essentially free.)

Figure 9: Levelised cost of energy, Q3 2012 (\$/MWh)



Source: Bloomberg New Energy Finance. Note: Carbon forecasts from the Bloomberg New Energy Finance European Carbon Model with an average price to 2020 of \$30/mt. Coal and natural gas prices from the US Department of Energy EIA Annual Energy Outlook 2012. Percentage change represents change from Q2 2012.

After an extended tumble, the equipment costs for PV projects have stabilised somewhat. Still, the LCOE for PV continued to fall in Q2 thanks to declines in operation and maintenance costs, though those were somewhat offset by slightly higher borrowing costs. This netted out to an approximately 8.5% drop in the LCOEs for PV crystalline silicon projects with tracking and those using thin-film equipment.

Falling Chinese turbine prices have pushed down onshore wind LCOEs at the lowest end, but Western cost reductions were small and offset by increased funding costs. Our cheapest wind scenario capex in the last quarter was roughly \$1.2m/MW, down from about \$1.4m/MW in Q1 this year. But the LCOE for onshore wind inched up slightly.