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Q4 2012 CLEAN ENERGY POLICY & MARKET BRIEFING

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2012 Clean Energy Investment Sinks 11% to \$269bn

Total funds invested in clean energy globally slipped by 11% in 2012 to \$268.7bn from a revised figure of \$302.3bn in 2011. Policy uncertainty, market overcapacity, and tighter credit conditions in some nations were all to blame, but declining wind, solar, and other equipment costs also played a major role. Indeed, despite the significant investment drop, new clean energy generating capacity actually deployed appears to have risen in 2012.

- China continued to shatter clean energy records in 2012. No less than \$67.7bn went into new Chinese clean energy projects and companies over the course of the year, up 20% from 2011. The Asia Oceania (ASOC) region overtook EMEA to account for the largest share of total investment. The Americas (AMER) trailed far behind.
- Geographic diversification of investment continued in 2012 as more developing world nations took part. Brazil, South Africa, India and China – the "BASIC" countries – attracted a record 35% of all investments. Meanwhile, non-BASIC / non-OECD countries received 9% of all funds invested.
- Uncertainty over existing or expiring policies appeared to depress investment in a number of nations. U.S. investment sank 32% from 2011 after key stimulus programs expired; Italian investment dropped 51% after a curtailment of solar subsidies; and Indian investment plummeted 44% after wind incentives expired and solar project approvals were delayed.
- Solar was the clean energy sector to attract the most funds with \$142.5bn invested, down 9% from its 2011 record. Wind investment totalled \$78.3bn, down 13%. The only sector to show growth in 2012 was small hydro (projects of less than 50MW) which posted a 17% rise to \$7.6bn.
- Small-scale project investment bucked larger trends to rise to \$80.2bn from \$76.5bn in 2011 largely due to a boom in residential and small commercial system installations. Meanwhile, asset financing (funding for large-scale projects) dropped to \$148.6bn from \$180bn.
- 2012 was a downright dismal year for raising new capital for clean energy companies via the public markets (the world's stock exchanges) with just \$5.75bn raised via IPOs and other offerings. Venture capital and private equity investment sank to a five-year low of \$5.8bn.
- The gap between east and west applied not just to investment but policymaking as well. A number of Asian nations accelerated initiatives in 2012, most notably China and Japan. Chinese officials now boldly plan to install 43GW of new clean energy in 2013, including large hydro and 10GW of solar.
- Overcapacity continued to predominate throughout 2012, strongly depressing prices for photovoltaic modules and wind turbines. Further price declines now appear likely for electric vehicles due to substantial overcapacity in lithium ion battery manufacturing.
- This report does not include final figures for new capacity added in 2012 though it does appear that a record number of new megawatts capacity came on line through the course of the year. Bloomberg New Energy Finance will release final capacity installation figures in the next edition of this report.

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Overall investment was down 11% but the trend toward geographic diversification continued with non-OECD nations accounting for 44% of total new funds deployed

1. INVESTMENT

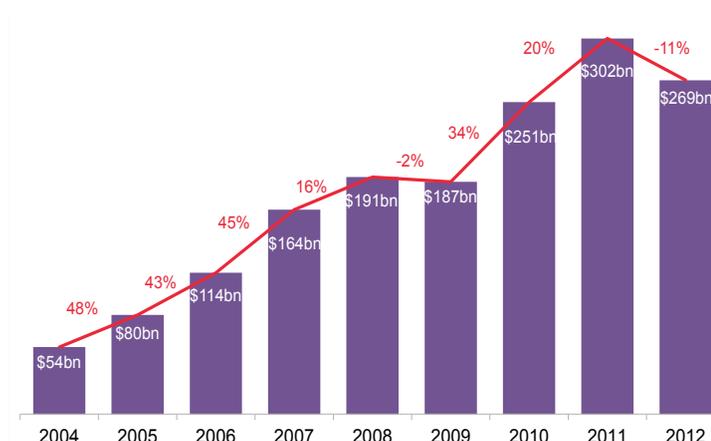
Clean energy investment declined 11% in 2012, weighed down by regulatory uncertainty and policy changes in major markets such as the United States, India, Spain and Italy. Sharply lower prices of solar and wind technology also exerted downward pressure on investment volumes, though they allow higher installation levels per dollar of funding. Overall, global investment in 2012 was \$268.7bn, down from a revised figure of \$302.3bn in 2011 (Figure 1). The 2012 investment total was the second highest ever recorded by Bloomberg New Energy Finance, and five times that of 2004.

The highlight of the 2012 total for clean energy investment was a record \$67.7bn outlay by China, up 20% on the previous year thanks to a surge in its solar sector. Its total was more than 50% above that of the second-placed country, the United States, with \$44.2bn. In 2011, the U.S. pipped China for first position as investors rushed to take advantage of stimulus-related programmes before they expired.

The trend toward geographic diversification in clean energy continued in 2012 with developing world nations accounting for a significantly larger share of the overall pie. Brazil, South Africa, India and China – the "BASIC" countries – accounted for a record high 35% of all investments (Figure 2). Meanwhile, non-BASIC and non-OECD countries also attracted a record 9% of all funds invested.

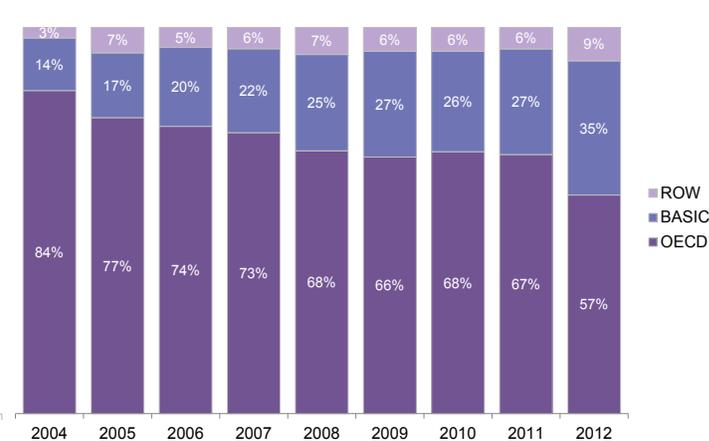
The year's stronger performers included South Africa, which saw investment leap to \$5.5bn, from just a few tens of millions in 2011, as its tender process for wind and solar led to a string of large project financings; and Japan, where the fresh emphasis on renewable power after the Fukushima nuclear disaster in 2011 and the start of a new subsidy programme, helped investment soar 75% in 2012 to \$16.3bn.

Figure 1: Global total new investment in clean energy, 2004-2012 (\$bn)



Source: Bloomberg New Energy Finance. Note: Includes corporate and government R&D, and small distributed capacity. Adjusted for re-invested equity. Does not include proceeds from acquisition transactions.

Figure 2: New clean energy investment by country bloc, 2004-2012 (%)



Source: Bloomberg New Energy Finance. Note: Excludes corporate and government R&D. Note: the BASIC nations consist of Brazil, South Africa, India, and China. ROW represents "rest of world" nations (non-OECD, non-BASIC).

Among countries experiencing falls in investment were the United States, with a 32% drop in the face of worries during most of the year about the expiry of a key support programme and competition from gas-fired projects; a 51% plunge in Italian investment to \$14.7bn as policy changes there curbed the country's solar photovoltaics boom; a 68% decrease in Spain to just \$3bn as its government announced a moratorium on subsidies for projects not yet approved; and a 44% setback in India, reflecting the expiry of incentives for wind, and fewer project approvals for solar.

Solar was once again the dominant sector in terms of overall clean energy investment in 2012. It accounted for \$142.5bn, down 9% on its 2011 record. Wind saw investment of \$78.3bn, down 13%,

while the third-largest sector, energy-smart technologies such as smart grid, energy efficiency and electric vehicles, suffered a 7% drop to \$18.8bn. Biomass and waste-to-energy was the fourth largest sector, at \$9.7bn in 2012, but this was 27% down on the previous year's figure. Biofuels, the second largest sector back in 2006, saw investment fall 38% to \$4.5bn, while geothermal experienced a 39% drop to \$1.8bn. The only sector to show growth in 2012 was small hydro (projects of less than 50MW). This saw a 17% rise in investment to \$7.6bn.

1.1. Asset finance and venture capital/private equity

As in years past, asset finance (funds invested in large-scale power-generating or biofuels-producing projects) accounted for the largest chunk of overall clean energy investment in 2012. However, asset financing sank both in absolute terms and as a percentage of overall investment. In all, \$148.6bn went into new large-scale projects, down from \$180bn in 2011. Asset finance represented 55% of all funds invested in clean energy in 2012, down from 59% in 2011. The percentage drop was due not just to the decline in dollars for big projects but also the rise in funding for small-scale distributed capacity (Section 1.2).

The decline was due to a variety of reasons. In the United States, uncertainty about the availability of the Production Tax Credit for wind projects in 2013 resulted in nearly zero wind project financings in the second half of 2012. In Europe, credit conditions continued to be challenging with financial institutions still making credit available but often with more stringent repayment terms or shorter repayment periods.

Among the largest projects financed in 2012 were four offshore wind sites in the German, UK and Belgian sections of the North Sea - Wikinger, Baltic II, Lincs and Northwind, at 400MW and \$2.1bn, 288MW and \$1.6bn, 270MW and \$1.6bn, and 216MW and \$1.1bn respectively. One bright spot for asset financing was the continued geographical diversification into countries that have just begun to embrace clean energy. Looming large in 2012 were the \$2.1bn financing of a 980MW small hydro portfolio on the Dnieper River in Ukraine; the Masen Ouarzazate solar thermal project in Morocco, at 160MW and \$1.2bn; and the Marena onshore wind portfolio in Mexico, at 396MW and \$1bn.

Venture capital and private equity investors are committing less money to clean energy start-ups as they face a tough fundraising and exit environment, given the current difficulties with taking private companies onto the public stock exchanges (see Section 1.3 for more on this). VC/PE investment shrank by a third in 2012 to \$5.8bn from \$8.7bn in 2011. The year began on a relatively robust note, with higher-than-usual figures for late-stage venture capital, but this momentum soon disappeared and the volume of investment dwindled to just \$1.1bn in both the third and fourth quarters. These were the lowest quarterly totals since 2006 and approximately half the level seen in the equivalent periods during 2011.

Down also is the number of venture financings. Bloomberg New Energy Finance tracked 421 investments made in early-stage companies in 2012, down 22% from the 543 in 2011. Disconcertingly, for an industry that must continue to innovate into the future if it seeks to reduce costs, investment rounds fell more sharply for companies at the earliest stage of development. "A" round venture capital financings slipped by 25% to less than 100 for the first time since 2006.

The decline took place amid a general downturn in venture capital investment. The aggregate value of all deals globally across every industry fell by 22% in 2012 to \$39.1bn from \$50bn in 2011, according to data from research firm Preqin. The firm also said that 1,216 venture capital financings were announced in Q4 2012, with an aggregate value of \$8.9bn – a 6% drop in number and a 5% decline in value compared with Q3 2012.

Figure 3: Global asset finance for new-build clean energy projects, Q1 2004–Q4 2012 (\$bn)

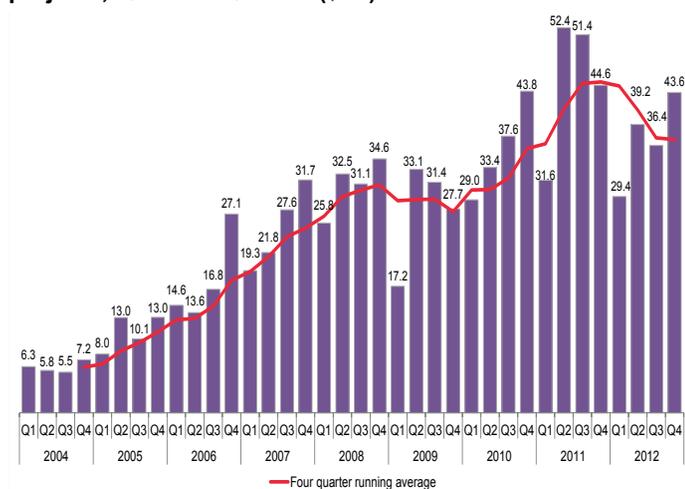
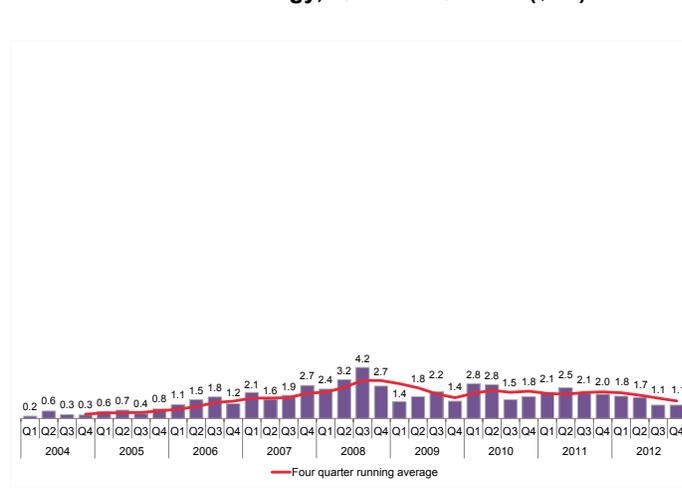


Figure 4: Global venture capital and private equity investment in clean energy, Q1 2004–Q4 2012 (\$bn)



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.

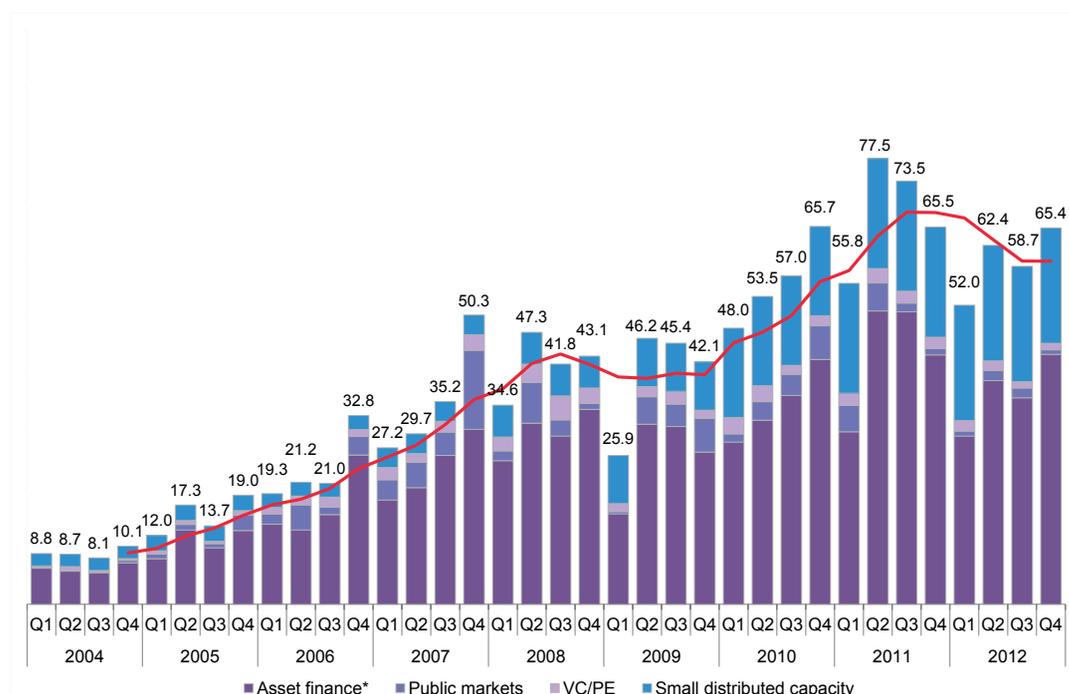
Venture capital and private equity investment sank to \$5.75bn, its lowest level since 2006, as exit opportunities for venture investors via the public stock markets were limited

Energy smart technologies (those focused on improving the efficiency of energy consumption) again accounted for the largest share of investment in the fourth quarter. There were 33 deals worth an estimated \$473m, an 8% increase on the amount in the previous quarter, according to Bloomberg New Energy Finance. The next-largest sector, solar, saw 20 transactions valued at \$315m, a 9% decrease on the preceding three months. Investment in biofuel companies declined 45% to \$121m from 13 separate funding rounds.

1.2. Small-scale financings

The growing strength of solar among the clean energy sectors is reflected in the volume of capital being deployed for small-scale installations. Total investment in small-scale projects bucked the larger trend of declining clean energy investment and actually rose in 2012 to \$80.2bn from \$76.5bn in 2011. This was despite the fact that prices for photovoltaic panels continued to plummet in 2012 and helped to bring down "all-in" solar costs for many consumers. Total photovoltaic capacity grew by approximately 10% in 2012, according to preliminary Bloomberg New Energy Finance estimates (final 2012 installation figures will be published in the Q2 2013 edition of this report).

Figure 5: Clean energy financings by asset class Q1 2004-Q4 2012 (\$bn)



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.

The NEX, which tracks the performance of 94 clean energy stocks, lost 5.5% of its market value in 2012 – better than the 40% decline in 2011. Meanwhile, the NYSE Arca Oil Index rose 1% in 2012, and the S&P 500 Index climbed 13%.

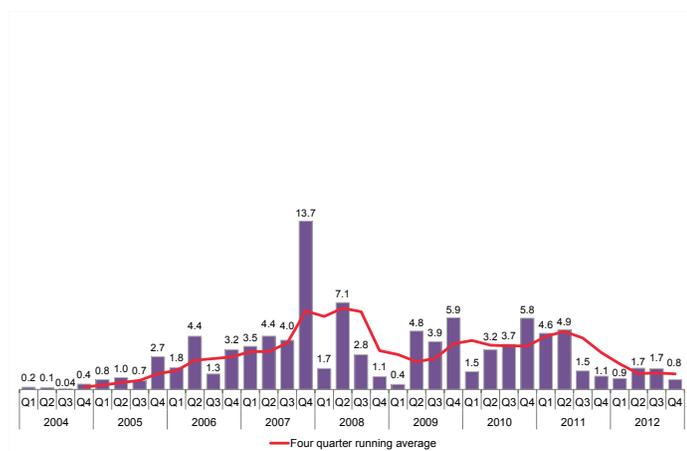
1.3. Public markets

2012 was a downright dismal year for raising new capital for clean energy companies via the public markets (the world's stock exchanges). Companies raised just \$5.75bn via IPOs and other offerings over the course of the year, down more than a third from the \$8.7bn raised in 2011 and a far cry from the industry's high-water mark of \$14.9bn in 2009. The fourth quarter was the worst of the year with just \$800m in new funds raised.

The clean energy sector was hardly alone in finding it tough going on the public markets. Worldwide, the volume of funds raised from initial share sales slumped to \$112bn in 2012, its lowest since the financial crisis, according to data compiled by Bloomberg. However, the situation did improve somewhat in the final three months of the year, particularly in Europe, where the \$5.7bn raised was a fivefold increase on the same period last year.

The poor performance of clean energy stocks provided the backdrop to this dire picture. The WilderHill New Energy Global Innovation Index, or NEX, which tracks the performance of 94 clean energy stocks, lost 5.5% of its market value in 2012, which was relatively moderate when compared with the 40% decline during the previous year. Meanwhile, the NYSE Arca Oil Index rose 1% in 2012, and the S&P 500 Index climbed 13%. On 25 July 2012, the index stood at its lowest point, some 78% below its peak value achieved in 2007.

Figure 6: Global public market new investment in clean energy, Q1 2004-Q4 2012 (\$bn)



Source: Bloomberg New Energy Finance.

Figure 7: 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.

Several Asian nations accelerated their clean-energy initiatives

2. POLICY

During the second half of 2012, an east-west divergence in low-carbon policy support widened. Many Asian nations accelerated their initiatives, while some mature economies in the West juggled their decarbonisation efforts with sluggish economic conditions and fiscal austerity.

China unveiled plans to triple in 2013 the 3.6GW of solar capacity added in 2012. It also plans to install 18GW of wind and 21GW of hydro capacity this year. While overall investment fell in India, federal- and state-level governments moved to significantly enlarge the country’s installed solar capacity over the next few years. Japan’s new solar feed-in tariff (FIT) attracted 3.3GW worth of applications. The Philippines also installed FITs, while South Korea set to the task of implementing a newly approved emissions trading scheme.

In contrast, two European nations hobbled by the effects of the Great Recession, Spain and Greece, attempted to backfill their deficits with unprecedented taxes on green energy production. Poland’s effort to pass a Renewable Energy Act, which was blessed with momentum as recently as October, broke down amid political acrimony. Denmark adopted less-generous FITs.

At the continental level, Europe experienced a crash in the trade value of credits in its path-setting Emissions Trading System. As the new year arrived, Brussels appeared bereft of the political will either to rescue the market or allow it to succumb.

There were a few positive developments in European clean energy subsidisation. The Netherlands’ coalition government decided in October to raise the country’s target for renewable energy from 14% to 16% of gross final energy consumption in 2020, and the country’s FIT budget will nearly double in April. France is raising its FIT payments, and the socialist-led government of François Hollande plans an offshore wind tender this year.

As has been its political wont, the United States exhibited a split personality on decarbonisation. The Obama administration pushed ahead with significant power-plant emissions restrictions and vehicular fuel-economy standards that could be set without Congressional assent. Republican leaders in the House of Representatives made it clear that there will be no new fiscal support legislated to replace the \$65bn in post-recession clean energy stimulus that will largely have been distributed by the end of 2013. Yet both parties, in New Year’s Day votes to avert macroeconomic calamity, agreed to renew and/or extend a basket of lucrative subsidies for renewables and energy efficiency.

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Congress extended the Production Tax Credit another year on 1 January 2013

2.1. AMER

In the **United States**, the Environmental Protection Agency moved to curtail greenhouse gas emissions from future coal-fired power plants creating significant potential opportunities for alternative sources of generation. EPA also helped write new U.S. Corporate Average Fuel Economy standards that will require the average new passenger vehicle sold in 2025 to meet the equivalent of a 54.5-mile-per-gallon target.

On the first day of 2013, Congress extended the Production Tax Credit for wind for one year, to 31 December 2013. Legislators changed the credit's qualifying criterion from when a project begins generating to when it gets under construction. As a result, what is officially a one-year extension became an effective continuation of the \$22/MWh credit for two or more years. Congress also reinstated tax credits for cellulosic ethanol and biodiesel.

The United States in 2012 placed import duties on solar cells from China and wind towers from China and Vietnam. According to year-end data, imports of China solar technology had declined from year-earlier levels. However, there was evidence that China panel makers were avoiding tariffs by using captive production facilities in other countries. U.S. manufacturers did not succeed in a follow-on effort to make dutiable China modules containing cells produced anywhere.

Brazil's 15th energy auction on 14 December 2012 resulted in 289MW of wind projects contracted at record low rates, averaging \$42.2/MWh. Reduced auctioned capacity and low prices came as a result of the country's economic slowdown, weak demand forecasts from power distribution companies and fierce competition from developers to enter Brazil's wind market. However, the results raise significant questions about whether such projects are financially viable and will ever get built.

Also in **Brazil**, just two days before the energy auction, Banco Nacional de Desenvolvimento Economico e Social (BNDES) imposed heavy local-content requirements on wind manufacturers wishing to tap BNDES's below-market credit facility called FINAME. It remains to be seen which foreign turbine manufacturers will be able to comply with the rules and remain in the game locally.

Ecuador in 2012 established its first FIT for renewable power, with especially generous solar support. The program prompted a run on applications from solar project developers, including Spanish company Isofoton, seeking to meet a year-end deadline to qualify for the 15-year subsidy.

In November 2012 **Nicaragua** announced an ambitious clean energy target, aiming to achieve 94% of renewable energy installed capacity by 2017, including large hydro. The country ended 2012 with 39% of nameplate capacity represented by renewables, including large hydro.

Also in November, **Jamaica** announced the country's first clean energy tender for private developers, opening 115MW for bids. This came as a result of a recent government regulation that cancelled the Petroleum Corporation of Jamaica's exclusive rights to develop renewable energy projects for the national grid.

In **Chile**, where the generation market has been largely unregulated for more than 20 years, utility-scale photovoltaic projects are poised to get built without the benefit of subsidies. This is due to the enormous potential in northern Chile, one of the world's highest-quality solar zones, combined with strong demand growth for minerals extraction. The government is also considering clean energy auctions to spur further build-out.

2.2. ASOC

China continues to surprise with its scale of ambition. The country will add 49GW of renewable energy capacity in 2013, including 10GW of solar, according to the National Energy Administration. This would shatter the previous record for annual solar installations of 7.9GW by Italy in 2011. It would also represent an almost tripling of the 3.6GW of solar capacity China added in 2012. The country's plans also include 18GW of wind and 21GW of hydro capacity this year.

China plans to triple 2012's solar capacity addition

China may increase the target for distributed PV projects by 2015 from 10GW to 30GW. The government has introduced a Distributed PV Application Demonstration District Programme with a proposed subsidy premium of CNY 0.4-0.6/kWh, for both self-consumed electricity and the excess power fed into the grid. The State Grid also announced plans to encourage distributed PV power generation. The grid operator issued a simplified grid connection procedure and clarified that distributed PV installations with less than 6MW of capacity will be exempted from the system reserve capacity fee.

China's subsidy allocation system became more complicated in 2012. The government released three batches of projects that are eligible for renewable subsidies, but these projects only account for 66% of the cumulative grid-connected capacity up to 2012. Some projects have not received subsidies since May 2011.

India is entering the next phase of growth in its solar sector. The federal-level National Solar Mission aims to build 3.6GW of solar capacity over the period of April 2013 to March 2017. This was stated in the draft policy released by the Ministry of New and Renewable Energy in December. The first auction in 2013 is likely to be for 1.65GW. Separately, several Indian states in 2012 announced plans for adding solar capacity. Tamil Nadu and Andhra Pradesh invited bids to build 1GW each. Rajasthan is tendering for 200MW. Many other states finalised policies in the October-December quarter and are lining up plans for tenders in 2013.

Australia's Climate Change Authority has released its statutory review of the country's "20% by 2020" Renewable Energy Target. The review definitively rejected calls by two of Australia's major energy companies to weaken the target. It made recommendations to increase investor certainty, such as decreasing the frequency of reviews from two to four years. The recommendations will now be considered by the government.

Australian solar programmes have been closed or reduced

The federal government phased out the Solar Credits programme (which provided an upfront subsidy for small-scale PV systems) six months ahead of schedule on 1 January 2013. As all state-based FIT programmes have now been closed or reduced, small-scale PV in Australia is now subsidised on terms comparable to wind.

Japan struggled to normalise its power sector operations and define its long term energy path in 2012. The government has avoided a difficult decision to restart nuclear reactors – no further reactors were turned on after two reactors at Ohi power plant restarted in July 2012. With the Liberal Democratic Party winning the lower house elections on 16 December, the plan crafted by the Democratic Party-led government to exit from nuclear power by the end of 2030's will not be executed. The new government will redraw Japan's long-term energy and climate change strategies. Meanwhile, the FIT programme started on 1 July 2012 has stimulated large new investments, the government had approved up to 3.6GW of FIT applications, of which solar represented 3.3GW.

South Korea has adopted a new emissions trading scheme

The **South Korean** cabinet adopted a new emissions trading scheme on 13 November 2012, following the establishment of the relevant law in May. On 19 December, Park Geun-hye, of the current ruling party, Saenuri, won South Korea's presidential election and is set to become the first female president of the country. She is expected to continue with the policies of the current government but may throttle back the speed of nuclear power plant construction due to safety concerns.

The **Philippines** approved long-awaited renewable energy FITs in August 2012 for solar, wind, biomass and hydro-sourced electricity. The government is working out its FIT implementation measures, such as specific project eligibility criteria and distribution method. The FIT rates approved were PHP 9.68/kWh for solar, PHP 8.53/kWh for wind, PHP 6.63/kWh for biomass and PHP 5.9/kWh for hydro.

Indonesia's government is refining its new geothermal FIT policy, which was introduced in August 2012. The policy raised the FIT from a previously capped USD 0.097/kWh to USD 0.10-0.18/kWh depending on the location and voltage of the grid interconnection. However, there was no clarity on

how future geothermal fields will be allocated. The current tendering process, a reverse auction system, will not work with a fixed-price FIT.

Thailand delayed its ban on sales of 91-octane gasoline from 1 October 2012 to 1 April 2013. Once the ban is lifted, the country's demand for ethanol is expected to double, to 1bn litres/year. With sugar prices expected to fall over the next 12 months, molasses-based Thai ethanol makers are positioned to gain.

Singapore replaced its Green Vehicle Rebate scheme with a Carbon Emission-based Vehicle Scheme effective from 1 Jan 2013. The new scheme would provide rebates of SGD 5,000-20,000 to buyers of vehicles with low carbon emissions.

2.3. EMEA

The **UK** capped a busy 2012 in energy by introducing its electricity market reforms in Parliament at the end of November. The bill legislates FITs with contracts for difference (CfDs) to replace green certificates as the main support scheme for renewables, starting gradually from 2014.

The UK also finalised support levels in December for solar and biomass under the existing Renewables Obligation green certificate scheme, which will take effect in April. FITs for small-scale projects now follow a quarterly digression system, and new rates took effect in November for PV and December for other technologies. The UK's flagship pay-as-you-save Green Deal for residential energy efficiency had a soft launch in October and will get fully under way at the end of January. Meanwhile, the new Green Investment Bank had its official launch at the end of November and made its first investments in biomass, energy efficiency and offshore wind.

Energy policy is becoming a pillar of campaigns in **Germany** leading up to parliamentary elections in September. In October 2012, the country's environment minister declared that the support granted to renewables needs to be fundamentally re-considered. Complete proposals are not due until March 2013 but on 28 January, the environment ministry revealed a surprising package of measures aimed at the escalating costs of supporting renewables. The measures included a one-time tax on existing renewable energy projects and a temporary suspension of FITs. They are envisaged to pass before the summer recess and be enforced in August.

In the **Netherlands**, the new government reached a coalition agreement at the end of October to raise the country's target for renewable energy from 14% under the EU Directive to 16% of gross final energy consumption in 2020. The government is now considering a supplier obligation and making the co-firing of biomass in coal plants mandatory. In the meantime, the Dutch FIT (SDE+) scheme for 2012 closed in December with the vast majority of its EUR 1.7bn budget having been allocated to renewable heat projects. A new SDE+ scheme will open in April with a EUR 3bn budget for 2013.

Italy in 2012 held its first auction since it moved away from green certificates as the main support scheme for renewables. 1.7GW was up for auction for larger wind, hydro, geothermal and biomass projects with 368MW available for smaller projects through a registry system. The auction did not attract a full quota of bids. Only one offshore wind project (30MW) came forward when 650MW in contracts was potentially available. Onshore wind did better with 18 projects securing 442MW out of a possible 500MW. Italy ended the year with two important decisions: it extended the white certificate scheme for energy efficiency by setting new energy-savings targets for 2013-16, and it introduced a new renewable heat incentive. The country also introduced a new net metering scheme that offers an alternative incentive for small projects.

France said it will increase support for PV with a higher FIT, bigger tenders for larger projects and a bonus for equipment made in the EU. The country also opened a national debate on energy transition, as President Hollande looks to fulfil his election pledge to reduce the share of nuclear power in the energy mix. The debate, which will get under way in earnest in 2013, will inform a new energy bill due as early as June. Meanwhile, France will launch a second offshore wind tender in Q1 2013.

Energy policy will be at the heart of the elections campaign in Germany

First auction in Italy, along with new net metering and renewable heat schemes

France bucks trend with higher support for solar – and starts energy transition debate

New taxes cut revenues from the existing PV projects in Greece

Spain's Parliament in December 2012 finalised a long-awaited fiscal package for the electricity sector – yet another attempt to restrain the growth of the notorious tariff deficit, which may have exceeded EUR 30bn by the end of 2012. The accumulated deficit is a result of a decade of the electricity sector not being able to recover its costs via the electricity tariffs. The package illustrated a compromise between various actors of the power sector and set a 7% tax on the value of all electricity generated, irrespective of technology. The tax applies to renewable energy in the country for the first time, but it is lower than what was feared earlier in the year.

Similarly, **Greek** power market operator Lagie is struggling with a growing deficit as a result of being unable to recover its costs from consumers' tariffs. As is in Spain, Lagie has struggled with a growing deficit related to clean energy subsidies. To address this situation, in November the government levied new taxes on the revenues from all PV plants larger than 10kW. Projects will see their post-taxation revenues shrink by 25% or 30%, depending on their size. Projects connected after March 2013 will receive lower tariffs.

Poland's work on the new Renewable Energy Act, which had appeared complete in October 2012, has hit a roadblock. Both the treasury and the finance ministry have expressed opposition to some parts of the draft. Concerns focus on the limitation of support for co-firing and the proposed higher technology coefficients (or banding) for photovoltaics. A proposed generous FIT support for 'microinstallations' has also come under fire. The likely enactment date is now January 2014 and the ministry of economy, responsible for the bill, is determined to allow no further delays.

Polish Renewable Energy Bill going through a phase of irreconcilable politics

The **Czech Republic's** new support regime eliminates an option to choose between FITs and green bonuses, a fixed premium paid on top of the market electricity price, for projects larger than 100kW (larger than 10MW for hydro). The new legislation also introduces bonus payments for distributed generation. Czech Energy regulator URE is also considering a complete phase-out of support for renewables in 2014, when the Czech 2020 target is expected to be met.

The renewable incentive schemes in the Baltic states have had a tricky few months. In **Estonia**, the government went back on an agreement with industry by keeping a cap on eligible wind energy production in its draft reforms to FITs. **Lithuania's** government approved draft legislation in January 2013 that would halt permits for renewable projects once capacity targets have been met, a move designed to slow down the PV sector. FITs were suspended in **Latvia** last summer until 2016.

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 among shareholders (see Section 1.3 above), they continue to reduce clean energy system costs for consumers to unprecedentedly low levels.

3.1. Dramatic declines for photovoltaic prices in 2012

Trends seen throughout 2012 continued in Q4 for factory-gate prices of photovoltaic equipment. The market continues to be dominated by substantial overcapacity. While 2012 did see significant consolidation among equipment makers and a fair number of bankruptcies, overcapacity conditions remained at the start of 2013.

The price for modules sank by 23% in 2012, according to data compiled in the Bloomberg New Energy spot price index. Multicrystalline silicon module prices dropped from \$1.02 at the start of 2012 to \$0.78 by year-end. Similarly, monocrystalline prices fell from \$1.07 to \$0.82.

The fall was much more pronounced over the course of the year for solar-grade silicon, the key ingredient in solar cells and ultimately modules. Silicon prices cratered from \$27.36/kg at the start of 2012 to just \$15.88 by year-end – a 42% decline.

In Q4 specifically, however, module and silicon prices moved in opposite directions. Module prices moved off their 2012 lows as demand picked up in countries with end-of-year deadlines to receive

subsidies. Multicrystalline prices rose 7% while monocrystalline prices rose 10%. Meanwhile, silicon prices sank 18% in the quarter (but have rebounded somewhat into the new year to \$16.16/kg as of 21 January).

Figure 8: Spot price of solar-grade silicon, May 2009-January 2013 (\$/kilogram)

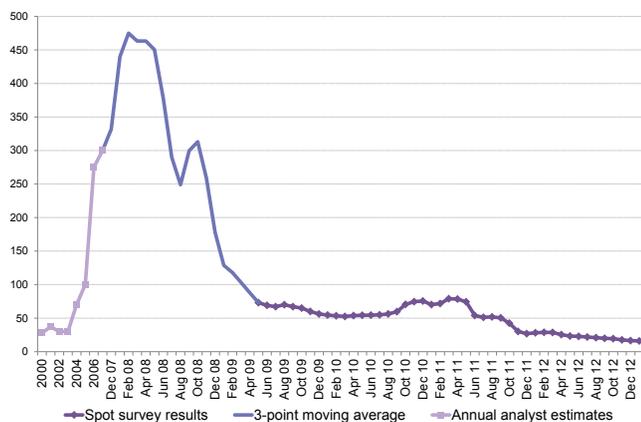
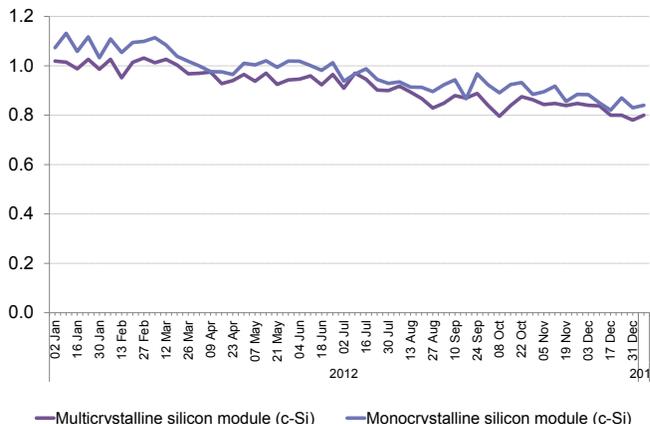


Figure 9: Price for immediate delivery of crystalline silicon modules, Nov 2010-January 2013 (\$/Watt)



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 – i.e., 8 August represents average for the week 8-14 August.

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.

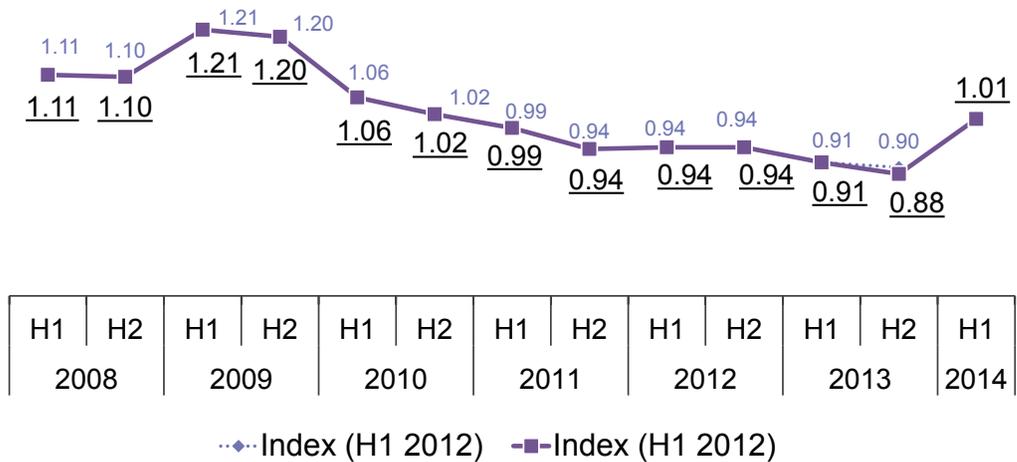
3.2. Wind turbine prices

Last year saw continuing pricing pressure on wind equipment, with the average price sinking to EUR 0.88m/MW during the second half of 2012, according to the Bloomberg New Energy Finance Wind Turbine Price Index. The latest average price is 27% below the peak seen in 2008 and 4% down from the first half of 2012. Volatile demand and low order intake for delivery in 2013, especially in the United States, has put further pressure on suppliers in 2012. Pricing is expected to stabilize in 2013, partly as a result of some capacity coming offline.

There remains a significant gap between the prices being paid for older models wind turbines (EUR 0.82/MW) and newer models (EUR 0.99m/MW). Newer models tend to be larger (with diameters often topping 100m) and have the potential for higher capacity factors.

Demand for turbines remains spotty across Europe, with most demand coming from northern countries. There was strong demand for turbines in the United States during the first half of 2012 as developers scrambled to erect projects before the 31 December 2012 deadline for the Production Tax Credit. Demand continues to rise in emerging market countries, particularly in Latin America, and including Brazil, Mexico, and Chile.

Figure 10: Wind Turbine Price Index mean price by date of delivery H1 2008-H1 2014 (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 sales and batteries

Total global sales of electric vehicles have consistently disappointed manufacturers who set expectations very high entering 2012. Through the first three quarters of 2012, a total of 76,000 pure electric vehicles (EV) had been sold worldwide. In part due to these disappointing results, demand for lithium ion batteries has fallen far short of global capacity. While this has resulted in challenging times for battery makers – particularly the independent players not attached to an automaker – it does foreshadow a decline in EV prices ahead.

Figure 8: EV lithium-ion battery short-term supply and demand, 2012-14 (GWh)

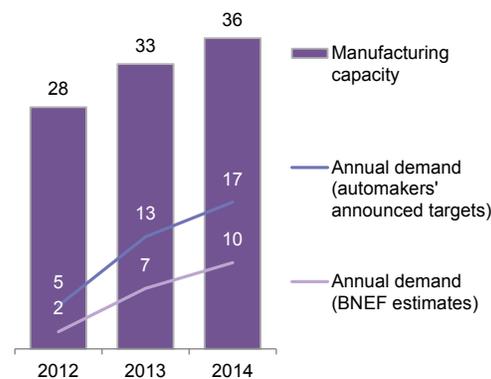
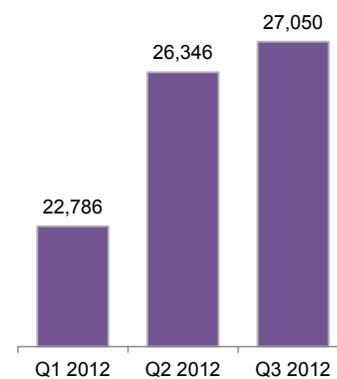


Figure 9: Global passenger EV sales, Q1 – Q3 2012 (units)



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

3.4. Levelised cost of electricity

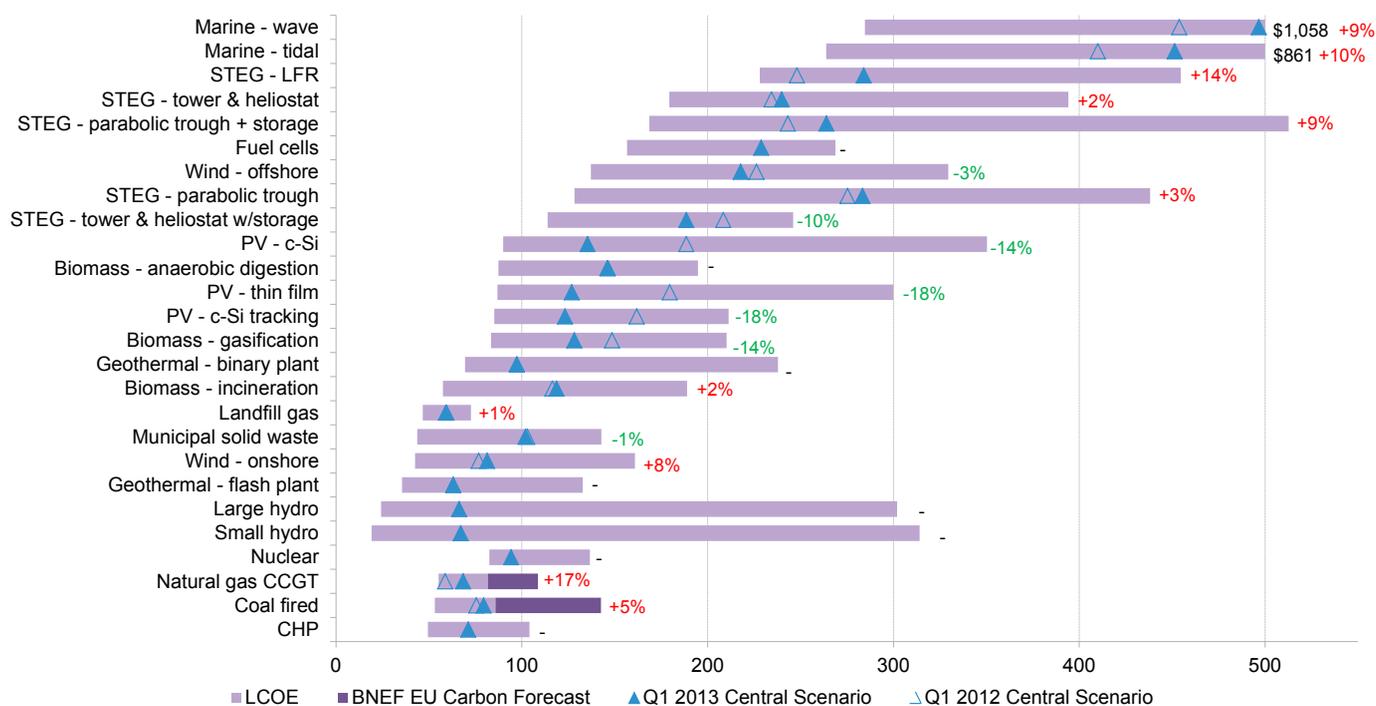
The levelised cost of electricity (LCOE) of a given technology represents the price at which a project owner can sell power and earn an acceptable return on his original investment. Each quarter, Bloomberg New Energy Finance examines the LCOEs of all the major clean energy technologies to

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.)

Here we compare the LCOE for the various technologies as they have changed over the course of 2012. Most notable have been the significant decline in costs associated with power generation from photovoltaics. The LCOE for projects that employ thin-film PV modules slid, on average, by 18%. PV projects employing crystalline silicon modules mounted on devices to track the sun saw their average LCOE sink by the same 18%. PV projects that use the same equipment at fixed angles saw their LCOE drop 10%.

Other clean energy technologies saw their overall delivery costs drop as well. The LCOE for biomass projects that employ gasification sank 14% over the course of the year. Offshore wind costs slipped 3%.

Figure 10: Levelised cost of energy, Q1 2013 (\$/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 U.S. Department of Energy EIA Annual Energy Outlook 2012. Percentage change represents change from Q1 2012.

The cost for onshore wind rose 8% during 2012, despite the fact that wind turbine prices remain low, as discussed above. The primary reason was that financing costs rose and tenors of available loans for wind projects dipped from 15 years to 12 years, on average. In addition, some of the newest model turbines deployed into the field are priced somewhat higher than the most established models. In the long run, these new turbines promise higher capacity factors and lower LCOEs, but for now they remain largely unproven in the field.