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Q3 2012 CLEAN ENERGY POLICY & MARKET BRIEFING

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Prepared by Bloomberg New Energy Finance for the Clean Energy Solutions Center, an initiative of the Clean Energy Ministerial

Weak Q3 puts clean energy on track to 2012 investment drop

Policy uncertainty, market overcapacity, lower priced equipment and challenging times for manufacturers contributed to a disappointing Q3 2012 for new clean energy investment. In all, wind, solar, biofuels, and similar new energy technologies attracted $56.6bn in new capital worldwide. That not only marked a 5% drop from Q2 2012 and a 20% fall from Q3 2011, but also virtually assured the industry will post its first year-on-year drop in annual investment in at least eight years.

- Questions over policy-makers' commitments in markets such as the US, the UK and Italy, an atmosphere of fiscal austerity, and comparatively low clean energy share prices are dampening investor enthusiasm. In addition, sharp falls in wind and solar photovoltaic (PV) technology costs mean the same megawatt capacity can now be bought for fewer dollars.
- Q3 fund flows differed across regions with new investment rising in Europe Middle East and Africa (EMEA) but slumping in the Americas (AMER). Quarter-to-quarter investment fell in the Asia-Oceania (ASOC) region but was up from Q3 2011.
- Activity continues accelerating in the developing world. Four of the quarter's top five project financings took place in Morocco, Brazil, and China. However, it appears unlikely the developing world uptick will offset declines in more developed nations in 2012.
- Depressed clean energy share prices are casting a pall over the sector and reflect challenges for equipment makers who have seen margins shrink. Still, the WilderHill New Energy Global Innovation Index posted a 1.2% Q3 gain, far better than the 15.5% Q2 plunge.
- Asset financing of utility-scale projects such as wind farms, solar parks and biofuel plants fell 10% in Q3 to $32.3bn from the prior quarter. The decline was much sharper from Q3 2011, when asset finance reached $49.5bn thanks in large part to the US federal loan guarantees.
- A bright spot remains the financial support for the small-scale segment of the market as interest in rooftop PV for residential and small commercial systems expands. Germany remained strong despite subsidy cuts. The US, China, and Japan are all also growing briskly.
- Clean energy trade tensions escalated. The European Commission launched an anti-dumping investigation of Chinese PV equipment makers. The US unveiled preliminary duties on Chinese-made wind towers. China has started an anti-dumping and anti-subsidy investigation of US polysilicon producers. The World Trade Organization has appointed a dispute panel to examine US tariffs on Chinese-made PV equipment.
- Solar PV equipment prices in Q3 hit new all-time lows with the global average spot price for polysilicon falling below $20/kg. Chinese-made multicrystallline modules slipped 9% from August to September alone to $0.77/W. The global price hit $0.88/W.
- Wind turbine prices are levelling off and actually inched up 2% during the first half of 2012, as buyers turned to newer, higher efficiency models that are pricier. Turbines for delivery in H2 2013 are now averaging EUR 0.95m/MW ($1.23m/MW).
- The lithium-ion battery market remains massively over-supplied suggesting a decline in electric vehicle prices is on the way soon.

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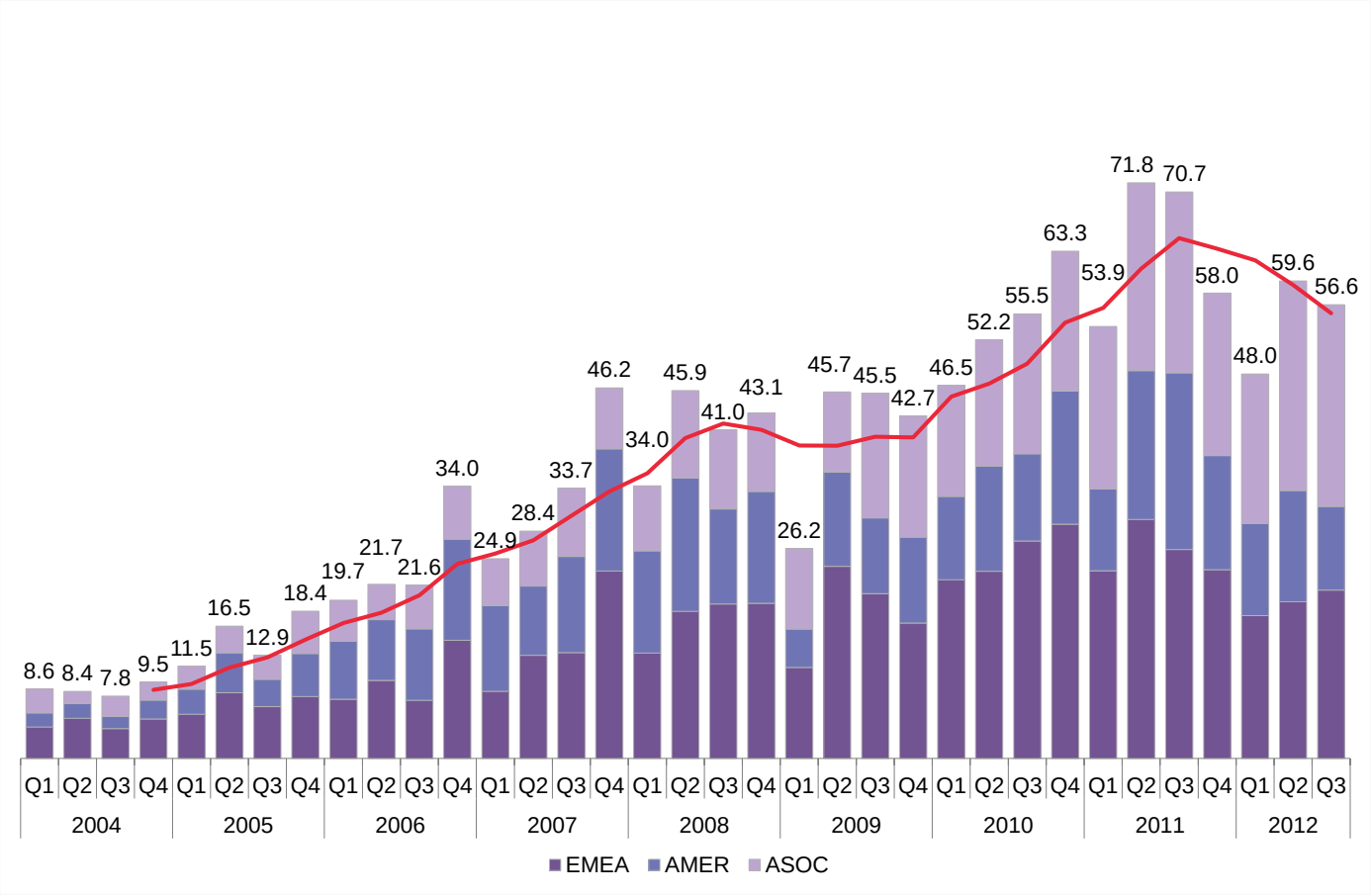
1. INVESTMENT

Global investment in clean energy totalled $56.6bn in the third quarter of 2012. This was down 5% on the second quarter and 20% lower than in Q3 2011. The drop was partly due to weaker figures from the US and India as well as a lull in wind farm financings. The new figures suggest that the full-year 2012 figure for investment in clean energy is likely to fall short of last year's record $280bn[1]. If so, 2012 would be the first down-year for world investment in the sector for at least eight years.[2]

The challenges facing clean energy in the third quarter continued to include policy uncertainty in key markets such as the US, the UK and Italy, and the dampening effect of low sector share prices on public market and venture capital investment. In addition, the recent sharp falls in the costs of wind and PVtechnologies have meant that the same megawatt capacity can now be purchased for significantly fewer dollars.

Figure 1: New financial investment in clean energy by geographic region, Q1 2004-Q3 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.

[1] The $280bn annual figure also included government and corporate research and development – items that are difficult to calculate quarterly.

[2] Bloomberg New Energy Finance data in early 2010 showed 2009 as a down-year, as the sector suffered the impact of the world recession. However subsequent information on projects and deals lifted the 2009 total just above that of 2008.

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A bright spot for investment overall has been the growing importance of developing world markets. The quarter's top four project financings took place in Morocco, Brazil, and China. Activity is expected to accelerate in these and other new markets in coming quarters. However, it appears unlikely that the developing world uptick will be substantial enough to offset declines in more developed nations. The result will be a 2012 investment decline from 2011.

Developing world activity is expected to continue accelerating but will not completely offset declines in more established markets in 2012

The quarter to quarter investment fall was not spread evenly across the three geographic regions. Total investment in the Europe Middle East and Africa (EMEA) actually rose to $21bn in Q3 from $19.6bn from Q2, but was off substantially from the $26.2bn invested in Q3 2011 and the all-time high quarterly investment of $29.8bn in Q2 2011. EMEA investment was bolstered by financings of major solar thermal and wind projects in Morocco.

Investment in the Americas (AMER) region slipped to $10.4bn in Q3 from $13.8bn in Q2 and from $22bn in Q3 2011. The US was largely responsible for the region's decline as total investment in the country fell to $7.3bn from $10bn in Q2 and from a record $18.9bn in Q3. Looming expiration of the federal Production Tax Credit (PTC) supporting the wind sector was at least partially to blame. Bloomberg New Energy Finance forecasts wind installations in the US to as low as 1.5GW of new capacity in 2013 from a projected all-time high of 12GW in 2012, assuming the PTC is not extended. Meanwhile, Brazil attracted $1.9bn in the quarter, up 94% from the prior quarter and up 24% from the same year-earlier period.

Investment in the Asia-Oceania (ASOC) region slipped only slightly to $25.2bn in Q3 from $26.1bn in Q2 but was up substantially from the $22.6bn invested in Q3 2011. China attracted $14.8bn in Q3, down from $17.9bn in Q2 but up from $14bn in Q3 2011. India's investment fell 16% on the quarter to $1.5bn and was 60% down from the same quarter in 2011.

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

Asset finance of utility-scale projects such as wind farms, solar parks and biofuel plants fell 10% in Q3 to $32.3bn from the prior quarter. There was a bigger decline when compared to Q3 2011, when asset finance reached $49.5bn thanks in large part to the final rounds of the American Reinvestment and Recovery Act, (ARRA) which funded innovative technology projects (Sec.1705) under the US federal loan guarantee program.

The location of some of the biggest projects financed highlighted a geographical shift in, with established markets such as the US, Europe and China losing momentum while newer markets in South America, Asia and Africa picked up steam. The top three projects getting the financial go-ahead between July and September were the Masen Ouarzazate solar thermal plant phase one in Morocco, at 160MW and $1.2bn; the Nareva and International Power Tarfaya wind farm, also in Morocco, at 300MW and $563m; and the Verace wind portfolio in Brazil, at 258MW and $497m. The fourth largest asset finance deal was a Chinese wind farm, and the fifth an Australian wind project. The largest financing of undisclosed value was the Ukrhydroenergo Dnieper River Small Hydro Portfolio consisting of 22 projects with a cumulative capacity of 980MW in Ukraine.

Venture capital and private equity investors ploughed just $1.3bn into clean energy firms in Q3, down 20% from Q2 and 34% lower than Q3 2011. Among the few large deals were a $200m funding round for US installer SolarCity Corporation, and a $104m round for biofuel developer Elevance Renewable Sciences, also of the US.

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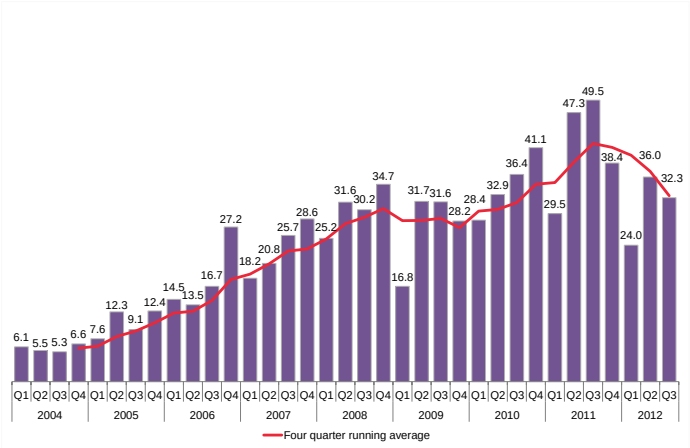
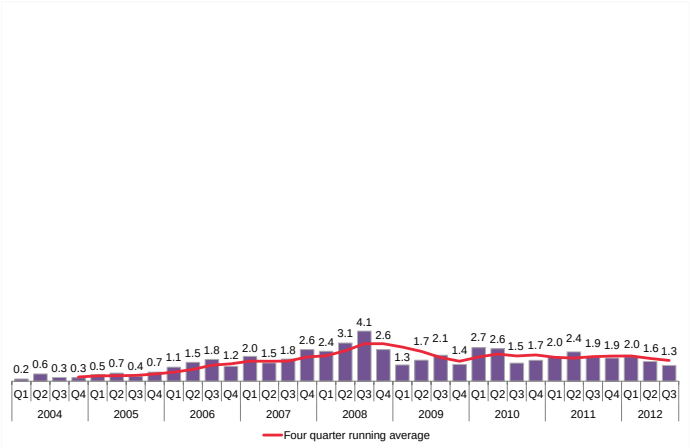
Figure 2: Global asset finance for new-build clean energy projects, Q1 2004–Q3 2012 ($bn)



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.

Figure 3: Global venture capital and private equity investment in clean energy, Q1 2004-Q3 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.

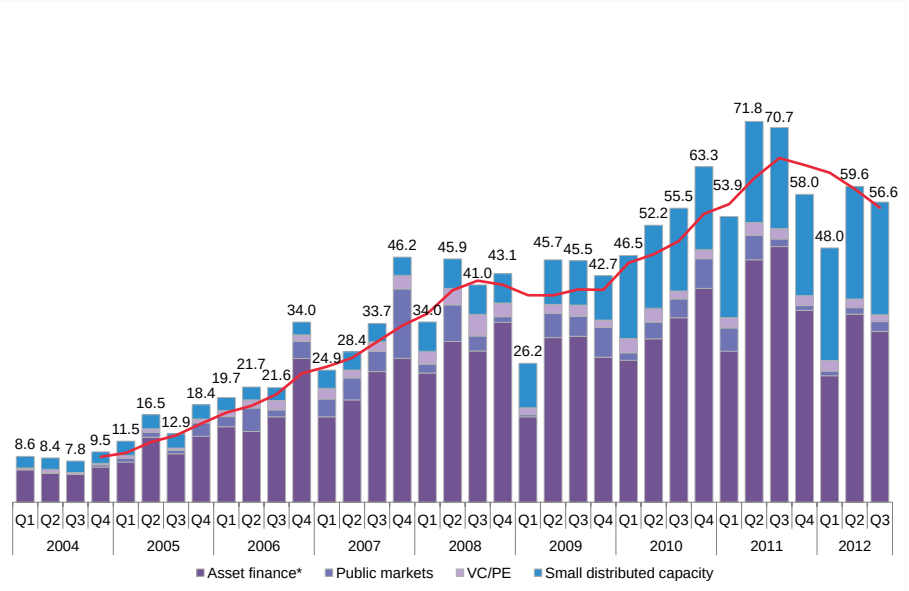
SolarCity made headlines shortly after the close of the quarter when it filed to raise $201m via an initial public offering on the Nasdaq. Such "exits" for privately held companies onto the public markets have been relatively rare in 2012, which has served to dampen enthusiasm among venture investors. A successful debut for SolarCity in coming months could help to reignite venture confidence.

1.2. Small-scale financings

Small-scale projects, such as rooftop solar, are estimated to have amounted to $21.3bn in the third quarter, in line with the previous three months and 11% up on Q3 2011. Germany has remained a strong small-scale solar market this year and, although Italy has dropped off sharply after the government brought an end to its generous subsidy offer, activity has been brisk in China, the US, Japan and the UK.

A strong IPO from California-based solar systems installer SolarCity could help rekindle venture investor interest in clean energy

Figure 4: Clean energy financings by asset class Q1 2004-Q2 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.

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1.3. Public markets

Public market (stock exchange) investors remained relatively bearish in their outlook on clean energy stocks during Q3. The sector attracted relatively little new public market capital during Q3. However, the sharp declines in clean energy share prices seen in Q2 were halted during the most recent quarter.

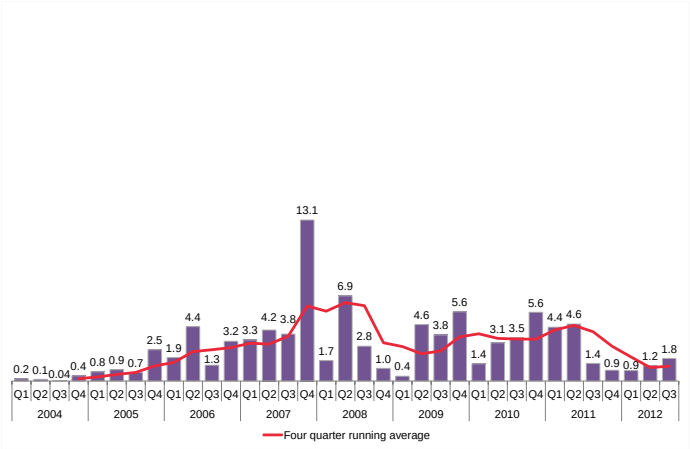
The NEX index eked out a 1.2% gain in Q3, far better than its 15.5% plunge in Q2

The WilderHill New Energy Global Innovation Index (NEX), which tracks a basket of 95 clean energy stocks traded worldwide, eked out a 1.2% gain in the third quarter, underperforming broader market indexes but recovering from a confidence-rattling 15.5% plunge in the second quarter. By comparison the large-capitalization S&P 500 advanced 5.8% in Q3, while both the technology-centric Nasdaq Composite Index and the MSCI AC World Index of global equities rose 6.2%.

Investment in quoted clean energy companies on the public markets has remained very sluggish. It totalled just $1.8bn in the third quarter, although this was enough to represent an increase of 47% on the second quarter and 28% on Q3 last year. The peak figure for public markets investment in clean energy was $13bn way back at the share price peak in late 2007.

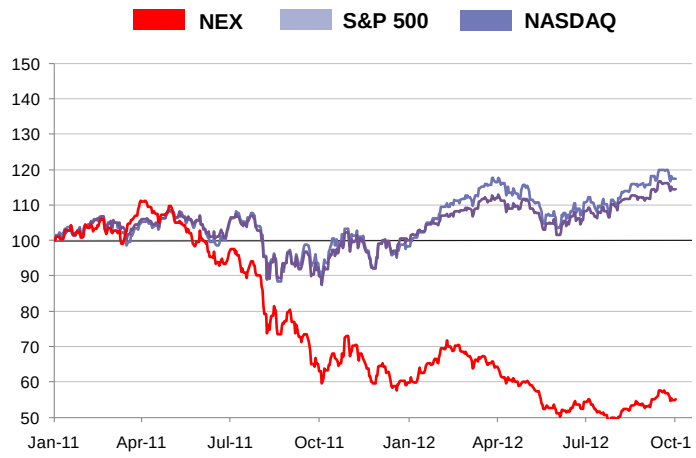
The biggest public market deals of the latest quarter were secondary issues, not initial public offerings. Solar cell maker Shanghai Aerospace Automobile Electromechanical Company raised $302.8m, while US electric vehicle concern Tesla Motors harnessed $225m.

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, 2011-Q3 2012



Source: Bloomberg New Energy Finance. Note: Values as of 1 October 2012; NASDAQ and S&P 500 rebased to 100 on 01 Jan 2011.

2. POLICY

Policy makers in a number of markets where clean energy has traditionally thrived continued to scale back subsidies and other supports through Q3. In the cases of heavily leveraged nations, fiscal austerity concerns are partly to blame. In others, policy-makers are simply seeking to stretch taxpayer or ratepayer funds further while keeping pace with the extraordinary drops in clean energy costs.

Meanwhile, there continued to be positive developments for the sector in developing markets, including China which unveiled a new Five Year Plan and is on course to be not just the top producer of PV equipment, but for the first time a top tier consumer of the equipment as well. Other nations in Southeast Asia, Latin America, and Africa all continue to make important progress on building policy structures that could attract private investment.

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Skirmishes between nations over the sensitive subject of clean energy free trade continued to grow in Q3 and a new front was opened in the EU. Such disagreements are to some degree inevitable given the economic development opportunities presented by renewables and various countries' desires to protect their domestic industries. However, this low-grade trade war has the potential to drive up clean energy equipment costs globally and make these new technologies less economically viable with their fossil-fueled rivals.

2.1. CLEAN ENERGY TRADE TENSIONS EXPAND AND ESCALATE

The EU began one solar trade case against China – and may start another

The EU took centre stage for trade tensions in Q3. The European Commission initiated an anti-dumping investigation into Chinese solar manufacturers on 6 September with preliminary measures due in June 2013 at the latest. This followed a complaint filed in July by the so-called EU ProSun coalition led by German equipment maker SolarWorld, which earlier initiated the anti-China solar cases in the US. The EU coalition responded to calls for talks from no less than German Chancellor Angela Merkel and Chinese Premier Wen Jiabao by launching a second complaint against Chinese imports on 25 September. This time the focus was on government subsidies allegedly provided to Chinese manufacturers.

Meanwhile, the trade spat between the US and China continued in Q3. At the end of July, the US International Trade Administration at the Department of Commerce added preliminary anti-dumping duties against Chinese wind towers to the anti-subsidy duties it had already applied. Final duties are due in Q4. On 10 October, the US set final levels for both types of duties on Chinese solar panels, with anti-subsidy duties higher than the preliminary ones.

China stepped up its retaliation, launching on 20 July its own anti-dumping and anti-subsidy investigation into imports of US polysilicon, the raw material used in PV modules. Meanwhile, its case against US duties on solar panels and wind towers among other goods will be heard in Geneva, after the World Trade Organization appointed a dispute settlement panel on 28 September. China is also considering opening a case against European polysilicon manufacturers.

2.2. TAXES – NEW TREND IN EUROPE?

Austerity-hit countries are increasingly turning to renewables for potential tax revenue

Until recently, tax policy as it has been applied by policy-makers around the globe has been used to subsidize clean energy or punish dirtier forms of generation. Tax credits have been applied in the US and elsewhere to spur growth. Carbon taxes, climate change levies and the like have always encompassed the "polluter pays" principle and been used elsewhere. In Q3 however, policy-makers in three EU nations began to regard the clean energy sector as a source of potential revenue generation.

Table 1: New tax schemes on renewable electricity power generators

Country	Date of announcement	Tax	Date of enforcement
Spain	14 September	6% additional tax on revenues generated from electricity	Subject to parliamentary approval
Bulgaria	17 September	Up to 39% on solar and 10% onshore wind – additional tax on revenues from renewable electricity to pay for "difficulties in integrating renewable power supply"	18 September, immediately after announcement
Greece	28 September	Temporary tax on renewable power producers proposed by the deputy energy minister Asimakis Papageorgiou	Not yet specified

Source: Bloomberg New Energy Finance, relevant ministries.

All three measures aim to help utilities and transmission system operators cope with the rising costs of absorbing increasing supply of intermittent, renewable power – whether it is the tariff cost (Spain) or the increasing costs of balancing electricity supplies (Bulgaria). While the proposed tax in Spain is

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moderate and was expected by the industry, the radical announcement in Bulgaria and its retroactive effect were an unpleasant surprise to the PV sector.

2.3. AMER

The **US** Army has set out to become a source of demand for renewable energy at a time when conventional utility procurement is scheduled to decline due to the fulfilment of a number of state-level renewable portfolio standards. In August, the Army issued a solicitation that will culminate in the award of multiple 'Indefinite Delivery/Indefinite Quantity' contracts, which are the rough equivalent of holding an open purchase order from the service. ID/IQ recipients will be qualified to compete for 'task orders' to provide renewable energy (specified in the solicitation as biomass, geothermal, solar, wind or other unspecified 'alternative' technologies) to Department of Defense installations. The solicitation anticipates up to $7.1bn in renewable energy procurement over 30 years.

The US military is poised to become a major procurer of clean energy – and a major driver of US project development

The US also issued greenhouse gas/fuel efficiency standards for passenger vehicles that mandate a fleet fuel consumption improvement of 60% from 2016 to 2025. The standards are final and likely to survive any legal challenges without major change.

US corn prices soared during the quarter, driving up prices for a multitude of corn-derived food products. That led to a formal petition by governors and interest groups asking the federal government to waive the legal mandate that 50bn litres (13.2bn gallons) of corn ethanol be blended with gasoline in 2012. A previous waiver petition, in 2008, was denied. A decision on the current waiver request is not expected until after the 6 November national elections, which are expected to have far reaching implications for US clean energy.

Brazil in August approved minimum smart meter requirements for residential end-users excluding-low income consumers. Power market regulator Agência Nacional de Energia Elétric has established that electricity distributors need to make smart meters available to consumers starting in February 2013. Smart meters will be compulsory for all new meter installations and for old meters that are being replaced. Distribution companies will be responsible for paying for the rollout. However, there is little clarity on how this program will be funded or whether Brazilian development bank BNDES will play a funding role.

Chile's House of Representatives in October approved the Mines and Energy Commission's proposal to up the mandatory clean energy obligation to 20% by 2020. Still, there is a long way to go until what would be Latin America's most ambitious RPS becomes a law. The country's executive branch does not believe the proposed target is a viable option for Chile and will probably use its power to hinder the law from passing. Chile is likely to join a handful of Latin American nations employing government sponsored reverse auctions to procure clean energy. Chile may announce its first clean energy auction early next year.

2.4. ASOC

Japan's solar subsidies have sparked an instant boom in solar installations but the country has not completely committed to phasing out its reliance on nuclear power

Japan in Q3 stopped short of pushing forward with a true zero-nuclear policy despite earlier calls from the Democratic Party-led national government to phase out use of the technology over the next three decades. Facing strong opposition, the Cabinet chose not to authorize a strategy that would have set a specific exit plan from nuclear. Instead, it chose to take the plan under advisement, but the matter appears far from settled.

Feed-in tariffs set on 1 July 2012 in Japan have already begun stimulating renewable energy investment. As of the end of August, the government had already signed 1.3GW of renewable projects to benefit from the subsidy. The government's original estimate was 2.5GW new clean capacity by March 2013 suggesting the subsidies are accelerating development ahead of schedule.

On 13 July, a panel under the Ministry of Economy, Trade and Industry proposed reform of Japan's power market. The plan includes retail market liberalisation and electric power grid unbundling – important steps to promote competition in power generation as well as the retail market. Such changes are also essential in order to welcome further renewable capacity onto the grid.

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It was a very busy quarter in **China** with the release of the new Five Year Plan for renewable energy (2011-15) that included a significant focus on expanding distributed solar.

Dragon targets for renewable energy

China is targeting 100GW of total installed wind capacity and over 20GW of solar energy by 2015 in its new Five Year Plan for renewable energy which runs from 2011-2015 and also includes targets for hydro and biomass power. Meeting the targets would require an investment of CNY 1.8 trillion ($283bn), the government estimates.

The plan also sets goals for 2020 – with the capacities for solar and wind doubling over the five-year period. The target for wind is 200GW while that for solar is 50GW. The interesting twist in the solar plan is the focus on distributed solar. The distributed PV target for 2015 is 10GW, which is the same as utility scale PV. By 2020, the target for distributed solar increases to 27GW while that for grid-connected large PV plants is much lower at 20GW, indicating an attempt to reduce pressure on the transmission grid.

Chinese PV equipment manufacturers face possible EU anti-dumping and anti-subsidy duties even as local governments are stepping up their support for the sector. The government of Wuxi province has helped Suntech secure CNY 200m in new debt from the Bank of China while the Xinyu government has helped LDK to repay part of its debts.

At least four Chinese cities have finalised regulations to launch pilot carbon trading schemes in 2013 – Beijing, Shanghai, Guangdong and Hubei.

South Korea's Ministry of Knowledge Economy announced on 18 July its first five-year smart plan, which aims to establish a nationwide smart grid system by 2016 and expand advanced metering infrastructure to 10m households representing half the country's population. It also seeks 1,000 energy storage systems and 150,000 public recharge outlets for use by electric vehicles. The Ministry estimates that households and businesses will save KRW 3.7 trillion ($3.4bn) annually on their electricity bills, while creating jobs and related industries worth of KRW 4.7 trillion ($4.3bn).

The country also progressed on plans to establish an emissions trading system by January 2015 with the Prime Minister's office announcing compliance rules on 23 July. South Korea will not allow companies to use international offsets to meet carbon caps until the third phase of trading in 2021. Also, companies will receive up to 97% of their emission allowances for free between 2018 and 2020, and 90% after 2021.

Australia has opted to establish a one-way linkage of its carbon market with the EU Emissions Trading Scheme starting 1 July 2015, with a two-way link slated for 2018. This will allow liable entities in Australia to buy European permits for up to 50% of their liability.

The state of South Australia set a record 3 September 2012 when power supplied from wind farms there touched 86%. On 5 September, 55% of the state's electricity demand for the day was supplied by wind.

The independent Climate Change Authority is conducting a statutory review of Australia's 20% by 2020 Renewable Energy Target. The review has divided Australia's three major energy companies, with two lobbying for a weakening of the target, and one stridently defending the current policy. The authority will deliver its findings to the government by 31 December 2012.

The **New Zealand** government is legislating amendments to its emissions trading scheme, following its 2011 review. Changes include deferring the inclusion of the agricultural sector in the scheme, extending the 'one for two' carbon unit surrender discount, and abandoning plans to limit the use of international offsets. The latter two provisions would make it difficult for New Zealand to link its carbon market with Australia.

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2.5. EMEA

Australia and the EU have agreed to link their carbon markets

After years of negotiation, the **European Union** passed its new Energy Efficiency Directive, the third pillar of its 2020 climate and energy strategy, with votes in the Parliament on 11 September and Council on 4 October. The Directive obligates the 27 EU member states to formulate energy efficiency targets by April 2013, which would collectively amount to 20% energy savings by 2020. Other provisions require utilities to deliver 1.5% annual energy savings, and governments to renovate 3% of their building portfolio annually. The Directive is likely to enter into force in November.

While uncertainties over support for PV and offshore wind connections were further clarified in **Germany** in Q3, concerns about rising electricity prices and insufficient grid availability continued, with ministers starting to discuss a "fundamental overhaul" of support for renewables.

To ensure some predictability for the future PV tariff reductions, monthly cuts will now be announced every three months. The depth of cut will be dictated by the installation levels in the preceding year. Starting from November 2012, tariffs will be cut by 1% per month if new annual installations have reached 2.5-3.5GW. If the annual installations are higher, the cuts will be deeper.

Germany has started discussing a "fundamental overhaul" of its renewables support

In late August, the German cabinet approved the offshore wind connection liability draft offering a compromise between transmission system operators (TSOs) and consumers. The agreement allows TSOs to add liability costs onto consumer bills capped at 0.25 eurocents per kWh. The legislation is expected to pass Parliament soon and enter into force in January 2013.

At the end of August, the government announced that support for the market premium scheme, which serves as an alternative mechanism to feed-in tariffs aimed at the market integration of renewables, will be cut in October.

These adjustments may be a prelude to a much larger revision in how Germany supports its clean energy sector. The country's environment minister has called for a "fundamental overhaul" and the Renewable Energy Act (EEG) will be subject to amendment. All options appear to be on the table, but moves towards market-integration of renewables and away from the well-established feed-in tariffs have been signalled.

Poland published a new draft energy bill, cutting support for biomass

Meanwhile, in **Poland**, the Ministry of Economy published a re-drafted version of the Renewable Energy Act on 27 July and yet another draft on 5 October 2012. The changes implemented in these two rounds of revisions confirmed the technology banding for the country's green certificate scheme as well as the feed-in tariff levels for small-scale projects. The proposed rates seem particularly attractive for small-scale PV, although the October draft has slightly reduced the rates proposed in July. Given that most neighbouring countries are revising down their support for rooftop solar, Poland may prove to be an attractive market for the sector.

However, co-firing biomass will see its support sharply cut and limited to five years of operation. This puts question marks over Poland's ability to meet its 2020 renewable energy target of 15%. Biomass, and co-firing in particular, was originally envisaged as contributing a large share to this target. The draft still needs to go through Parliament but its enactment date is envisaged as 1 January 2013.

New reverse auctions for renewable power generating contracts are now underway in Italy

Italy enacted its changes to replace the green certificate scheme for renewables with reverse auctions to allocate premiums. The first such tender for onshore wind generation opened on 8 October. It includes a specific floor price to avoid overly audacious bidding and sets a cap for 500MW of capacity additions per year. The feed-in premium for solar meanwhile was amended on 27 August from a fixed bonus to a “top-up” tariff. Registries for PV now cap overall yearly spending at EUR 6bn.

The **UK**’s busy year continued as it casts a wide net of clean energy policy. New banding levels for green certificates, or ROCs, were finally announced in July. They included a smaller cut for onshore wind than feared by the wind industry and changes to promote the conversion of thermal plants to operate entirely on biomass feedstock, rather than on co-firing of biomass and coal. Many aspects remain undecided, including cuts to solar supports. Feed-in tariffs, which are just for smaller projects

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in the UK, were cut for solar in August, and digression mechanisms were established to add predictability to the market.

New UK infrastructure loan guarantees are likely to include energy projects

The Electricity Market Reform process has not faced an easy ride in the UK with a parliamentary committee describing the proposed new incentive scheme for renewables known as Contracts for Difference as “unworkable”. Legislation is now expected in Q4.

Meanwhile, the government has launched a GBP 40bn infrastructure loan guarantee scheme. Energy projects are expected to represent over half of the 500 likely to benefit. Smaller grant funding was launched for energy efficiency and storage technologies, and for wave and tidal energy prototypes in Scotland.

In **France**, President Francois Hollande recommitted in September to closing nuclear plants and keeping a moratorium on fracking. National debates and a new energy bill are now expected next year. The governing coalition will cut the nuclear share in power generation from 78% to 50% by 2025. Hollande also proposed EU CO_2 reduction targets of 40% by 2030 and 60% by 2040 on 1990 levels, and offered to host climate negotiations in 2015.

France selected 520MW of large rooftop PV projects under its tender for feed-in tariffs, after receiving bids representing over three times that capacity. This was more than the capacity initially prescribed but a higher amount was awarded because there were fewer bids than expected under separate tenders for mid-scale projects. The next PV tenders will be opened before the end of the year, earlier than planned, while the ministry is considering raising feed-in tariffs and adding an EU content bonus. The second offshore wind tender will be launched by the end of the year.

Spain’s proposed 6% tax aims to plug a EUR 24bn tariff deficit

Following months of speculation regarding tariff cuts and additional taxation of renewable energy generators, **Spain** proposed a 6% additional tax on revenues from electricity generation – renewable and fossil alike – in September (see Table 1). Much more dramatic action had been feared by power generators. The cost of feed-in tariffs has been guaranteed by the government rather than passed onto consumers, resulting in a "tariff deficit" of EUR 24bn at the end of 2011. These taxes, along with additional duties imposed on nuclear generation, aim to plug this deficit.

Two announcements in Scandinavia suggest an uncertain future for coal in the region. **Finland**’s Minister of Economic Affairs, Jyri Hakamies, on 28 September proposed phasing out coal power by 2025, as the country prepares a new energy strategy later this year. **Denmark**’s new Energy Agreement, most of which was approved by parliament last summer, will also see coal becoming increasingly redundant, according to the Danish Energy Agency. The country will build new interconnections with Europe to increase imports during peak demand.

Belgium extended the lifetime of Tihange 1, one of its largest nuclear plants, by ten years in July, despite a 2011 agreement to phase out nuclear power. Also in July, the Flanders region of the country cut its green certificate support levels for renewables.

3. TECHNOLOGY

Overcapacity conditions continue to predominate in the largest clean energy sectors with a worldwide glut of wind turbines, PV modules, and lithium ion batteries for use in electric vehicles. This continues to push down equipment costs and is making it difficult for some manufacturers to survive. In the long run, lower prices are excellent news for the clean energy sector which must become more cost competitive with conventional sources. Still, in the near term, they are causing significant heartache and heartburn for those involved in manufacturing.

3.1. Photovoltaic prices

Solar PV equipment prices continued to sink in Q3, hitting new all-time lows, according to the Bloomberg New Energy Finance Solar Price Index published 20 September. Substantial overcapacity remains the primary reason behind the declines and the market shake-out continues with some competitors now exiting. The global average spot price for PV-grade polysilicon stood below $20/kg

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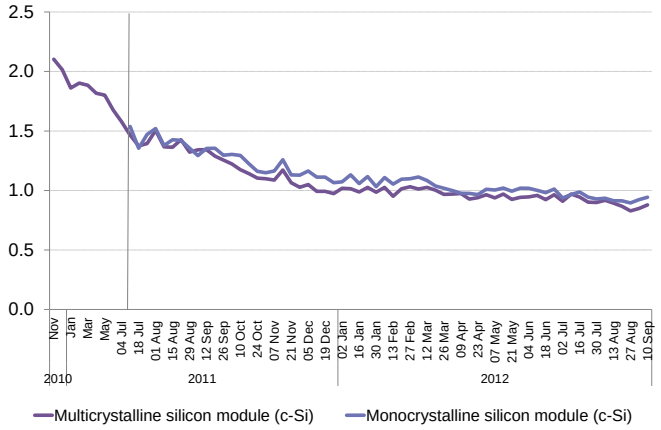
as of mid-September (see Figure 7). The price for Chinese-produced polysilicon stood at $20.1/kg while the price for the commodity produced in all other nations averaged $19.7/kg.

Current prices are below the marginal cash cost of production for a vast majority of polysilicon producers. There are, however, still legacy "take-or-pay" contracts where the purchaser is forced to resell its more-expensive contracted silicon to the spot market at a loss, as it is cheaper than to use the polysilicon internally and incur higher losses. Still, these take-or-pay contracts are not substantial enough to cause the current spot price to be so low; some producers are clearly now making polysilicon and selling it at a loss.

Figure 7: Spot price of solar-grade silicon, May 2009-September 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 8: Price for immediate delivery of crystalline silicon modules, Nov 2010-September 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.

At the other end of the PV value chain, crystalline modules continue to drop in price. The price for a Chinese-made multicrystallline panel slipped 9% from August to September to $0.77/W. The overall global price fell a more modest 1.6% to $0.88/W. At the low end, some of the less established Chinese equipment makers are known to be selling multicrystalline modules for as low as $0.50-0.60/W.

3.2. Wind turbine prices

Political uncertainty continues to hamper growth within the wind markets in the US, Europe, China. While activity is picking up in new developing world markets, that growth is not yet offsetting declines in traditional areas of industry support. A weak 2013 now appears unavoidable, even if the US were to extend its Production Tax Credit (PTC) subsidy immediately. Confronted with these challenging conditions, the industry has adopted survival strategies by upgrading turbines and focusing on building premium higher margin projects.

One silver lining for the industry is that although sales volumes are down, prices for wind equipment appear to have stabilised. In addition, project acquisition volumes are actually rising as new investors find attractive deals in reliable and well managed assets.

Turbine prices inched up 2% during the first half of 2012, according to the Bloomberg New Energy Finance Wind Turbine Price Index released in July. This marks the first rise since 2007 and the equipment now averages EUR 0.95m/MW ($1.23m/MW), assuming a delivery date of H2 2013. The uptick in the overall average price is due primarily to the fact that buyers are now increasingly turning to newer model turbines with taller towers and larger rotor diameters. While this equipment is somewhat pricier, it also offers better efficiency for project owners. For older model turbines sized

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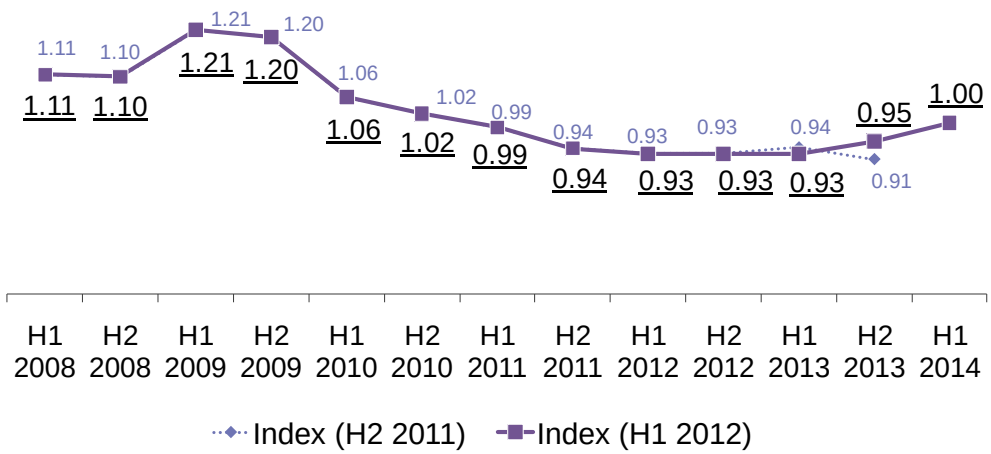
2MW or smaller, prices slid 6% through the first half of 2012 and now average EUR 0.82m/MW ($1.06m/MW), assuming delivery in H2 2013.

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.

The oversupplied market is inevitably causing contraction. Global wind turbine manufacturing capacity has most likely peaked this year and will gradually decline in the next few years as old plants close while those strategically located survive and in some cases are converted for use in servicing. The first nine months of 2012 have seen plants close and asset sales in China, Spain and the US. These have been accompanied by the inevitable worker layoffs.

3.3. Electric vehicle battery supply and demand

Slower than expected electric vehicle (EV) sales in 2011 have prompted major automakers to revise down their sales estimates for 2012. Upstream, the disappointing sales figures have also resulted in significant over capacity in the lithium-ion battery market. This is prompting the makers of these batteries to seek new opportunities beyond EVs.

Global lithium-ion battery supply capacity (Figure 7) online in 2012 Bloomberg New Energy Finance estimates at 28GWh total annual capacity. Given the new plants under construction, that should rise to 36GWh in 2014.

Demand for such batteries from EVs falls far short of potential supply. Based on automaker forecasts as of August, the EV market will demand just 5GWh of batteries in 2012 and 17GWh in 2014. This is based on an assumed production of over 300,000 such vehicles in 2013 and nearly 1m in 2014.

Those estimates appear overly optimistic, however. EV sales totalled 51,000 units in 2011 and approximately the same number of vehicles was sold through the first half of 2012. While this puts the industry on track for a record year for EV sales, it is likely to fall far below its 300,000 estimate.

Figure 7: Electric vehicle lithium-ion battery short-term supply and demand, 2012-2014 (GWh)

Figure 8: Energy storage projects using lithium-ion batteries (MWh)

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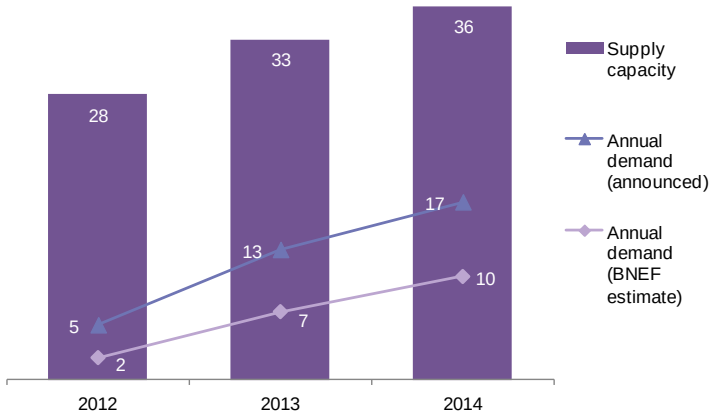
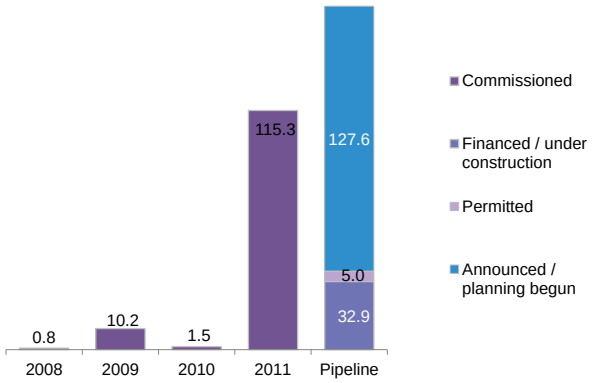


Source: Bloomberg New Energy Finance



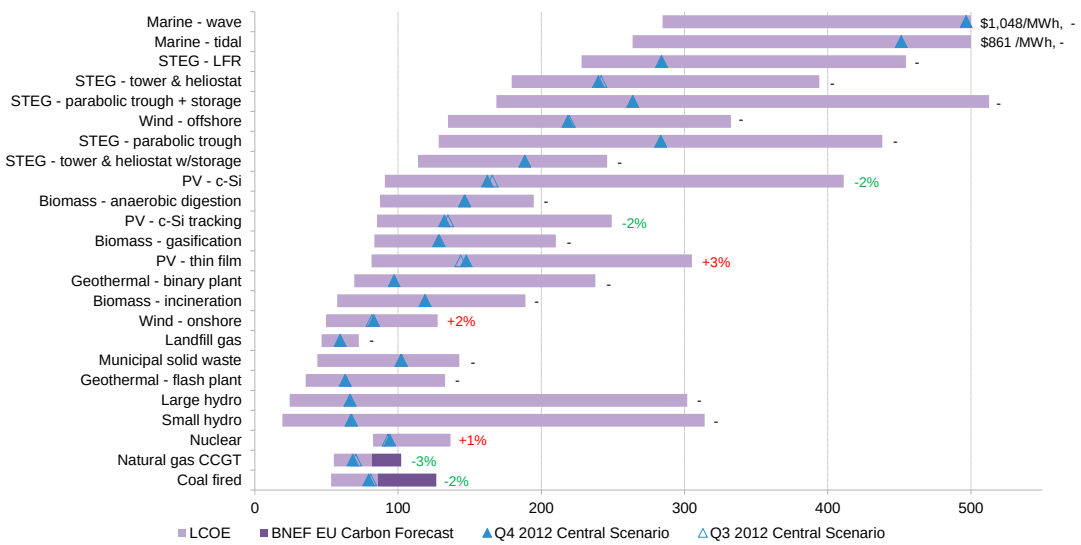
Source: Bloomberg New Energy Finance

The capacity overhang is prompting some lithium-ion battery makers to pursue new markets. One area of interest involves providing power storage to the grid. Last year saw 85MWh of such grid storage projects commissioned worldwide. While this market is tiny by comparison to current lithium-ion manufacturing capacity, it could potentially offer some promise.

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 three factors: the cost of the equipment needed for a clean energy project, the cost of the capital needed to finance that project, and the project's load factor. (Marginal costs are minor since the fuel – the wind, sun, sub-surface heat for geothermal, etc. – is essentially free.)

Figure 8: 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.

Given a relative scarcity of new project financings in Q3, there were few data points available with which to update LCOEs for the various clean energy technologies. The average LCOEs for small hydro, biomass, geothermal, and a number of others all essentially remained level from Q2 to Q3.

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There was no shortage of financings in the PV sector, however. The LCOE for PV projects employing crystalline silicon module ticked down slightly during the period as the lower cost of equipment continued to be felt throughout the market. There was a wide variety of costs observed with geography largely dictating pricing. For instance, in Japan 150MW of new utility-scale projects were financed at an average CAPEX of $4.2m/MW – more than double the average of $2m/MW in Europe.

The LCOE for onshore wind ticked up slightly (2%) in Q3, partly because the market is increasingly embracing newer model, higher priced turbines. Older turbine prices continue to decline but the emphasis on newer models in the market has resulted in an overall small uptick in the LCOE for onshore wind. There have been no financings for offshore wind projects since Q1. As a result, our latest LCOE for offshore remains flat from last quarter.

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