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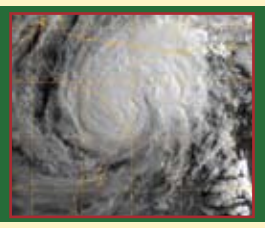

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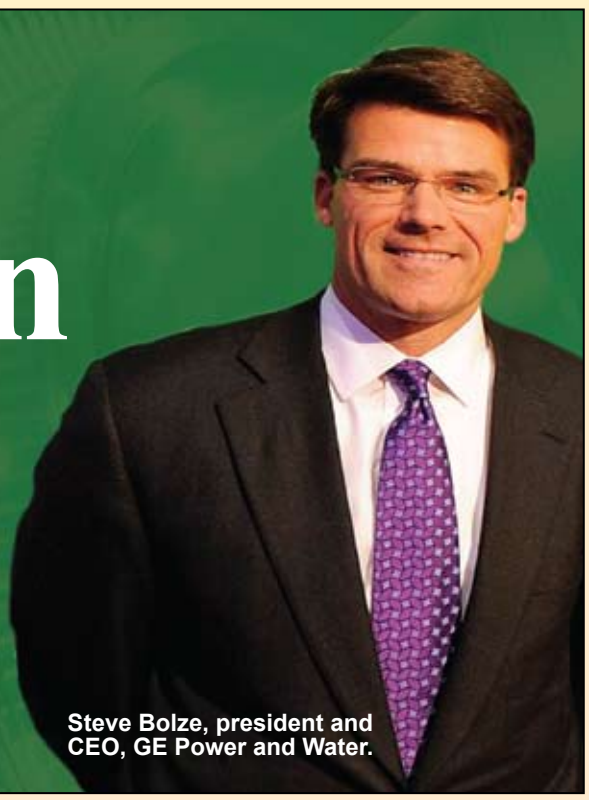
Cheap gas puts focus on gas turbines



Steve Bolze, president and CEO, GE Power and Water.

The increasingly positive outlook for gas is seeing equipment manufacturers extend their portfolios to address the growing market for gas fired generation, but some experts sound a word of caution. **Junior Isles**

Underscoring the growing trend to use abundant, cleaner burning natural gas for power generation, GE said it has received more than $1 billion in orders for heavy duty and aeroderivative gas turbines for projects throughout North America since year-end. Alstom also recently introduced an upgraded version of its heavy duty gas turbine for the 60 Hz US market.

The increased activity is partly based on cheap gas prices, especially in the US, driven by developments in the extraction of shale gas.

"Several factors are driving strong interest in natural gas," said Steve Bolze, president and CEO, GE Power and Water. "The recent increase in production has helped to ensure reliable supply and a consistent price structure, making natural gas an economically viable, dependable option for power generation needs. It also is the cleanest fossil fuel and a strong fit for the flexible, efficient power generation that our customers need to enable the integration of more renewable resources into the power grid."

At the same time, GE also unveiled its newest aeroderivative gas turbine, the FlexAero LM6000-PH. The launch of this latest turbine follows the introduction of its FlexEfficiency 50 combined cycle gas turbine (CCGT) power plant in May this year. The power plant is designed to deliver high operational flexibility with an efficiency of more than 61 per cent.

At the end of September, GE signed a memorandum of understanding (MOU) with Toshiba to mutually promote new combined cycle power plants with GE Frame 9FB gas turbines incorporating GE's FlexEfficiency technology and Toshiba's high efficiency steam turbine-generators for projects in Japan and other Asian countries.

> "These product upgrades are our response to the renewed growth we are witnessing in the natural gas fired power generation markets"

Meanwhile, Alstom announced the launch of its upgraded GT24 gas turbine and the corresponding KA24 combined cycle power plant offering for North America, parts of Latin America, Asia and the Middle East (60 Hz market). This step follows the launch in June of its upgraded GT26 gas turbine and the corresponding KA26 combined cycle power plant for the 50 Hz electricity markets.

Mark Coxon, Senior Vice President of Alstom's Gas Business said: "These product upgrades are our response to the renewed growth we are witnessing in the natural gas fired power generation markets. We see the role of combined cycle power plants to be increasingly used as a back-up technology enabling more renewable power to be integrated into the energy mix. Accordingly these products have been optimised not only to offer very high output and efficiency, but also outstanding operational flexibility."

Natural gas prices in North America have been low and steady in recent years, as drillers have learned to unlock vast amounts of natural gas once thought inaccessible in shale formations throughout the US.

Natural gas is currently trading at around $4 per thousand cubic feet, and has traded in a range of $3 to $6 in recent years. In the middle of the last decade natural gas prices were extremely volatile and spiked as high as $14. Those unsteady and high prices discouraged utilities from adding much natural gas fired capacity.

Now, after several years of low prices and increasing supplies, US utilities are more comfortable with natural gas.

But any wholesale move to natural gas should be approached with caution. In a report published in May, David Hughes a geoscientist and Post Carbon Institute Fellow questioned whether gas will fuel America in the 21st century.

The report analyses the Energy Information Agency's (EIA) gas production forecasts, noting: "gas production forecast reveals that record levels of drilling will be required to achieve it". It also draws attention to resistance resulting from the potential environmental impacts.

"Even assuming the EIA forecast for growth in shale gas production can be achieved, there is little scope for wholesale replacement of coal for electricity generation," it states. The report says that achieving the forecasted growth would also require a massive build out of new infrastructure, including pipelines, gas storage and refuelling facilities. "This is a logistical, geological, environmental, and financial pipe dream," it said.

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The switch from coal to gas for power generation is also being driven by the tightening emissions regulations that utilities are facing.

However, a recent US study says switching from coal to natural gas, even though natural gas emits far less carbon dioxide, would not significantly slow down climate change.

The study by the National Center for Atmospheric Research (NCAR) notes that while coal use contributes to warming because it emits heat-trapping carbon dioxide, it also releases comparatively large amounts of sulphates and other particles that, although detrimental to the environment, cool the planet by blocking incoming sunlight.

Natural gas operations, on the other hand, are known to leak a certain amount of methane, an especially potent greenhouse gas, into the atmosphere.

Computer simulations run by NCAR researcher Tom Wigley suggest a greater reliance on natural gas would begin to slow down the increase in global average temperatures by 2050 but only by a few tenths of a degree.

Back in favour: gas turbines

While natural gas prices in the US have been subdued because of abundant shale gas supplies, they have risen along with oil in much of the rest of the world.

Peter Voser, chief executive of Royal Dutch Shell recently told the *Financial Times:* " We will have a lot of volatility ahead of us that we cannot avoid… for energy prices in general.

He added: "We most probably will see a tightening of the demand-supply balance and hence rising energy prices in the long term."

He said the problem was not a lack of oil and gas in the ground but inadequate investment as a result of the financial crisis.

Europe, which is currently struggling with a debt crisis, has also been putting more emphasis on gas as many countries make the transition to a low carbon economy. The European gas sector was given a further boost following the announcement by Cuadrilla Resources that preliminary drilling results at a site close to Blackpool, Lancashire, in the UK, indicate approximately 200 trillion tcf of shale gas reserves. Analysts expected shale gas would be found – Blackpool sits on one of three major shale gas basins in Europe, known as the Carboniferous marine basin, which stretches across England, the Netherlands, North West Germany and South West Poland – but the size of the find was more than expected.

Frost & Sullivan said, based on a reasonable assumption that 20 per cent of the gas is recoverable, this means that the UK has gained 40 tcf of gas reserves from a single basin. This comes just six months after the EIA estimated that the entire country had 20 tcf of technically recoverable shale gas reserves.

Climate funding proposals ahead of Durban

Steven Gray: acknowledgement of private sector engagement

A draft plan on climate finance, which could be adopted at the G20 summit in Cannes in November, may form part of a new global accord on climate change. **Junior Isles**

Global financial institutions are recommending raising money to fight climate change by trimming subsidies for fossil fuels, pricing carbon emissions at $25 per ton and collecting a surcharge on aviation and shipping fuels.

The recommendations are part of a draft paper by the International Monetary Fund (IMF), the World Bank and other international groups that was prepared for a meeting of G20 finance and development ministers last month.

The paper, which was leaked prematurely and distributed by aid agencies, followed a UN meeting on climate funding earlier in the month.

The UN's Framework Convention on Climate Change (UNFCCC) secretariat reported that a meeting of the fund's Transitional Committee in Geneva delivered "advances on the nuts and bolts of how the Green Climate Fund (GCF) will function" including "a broad agreement on the importance of private sector engagement".

Steven Gray, London-based head of international and UN policy at asset manager Climate Change Capital, who attended the meeting, said that there was an acknowledgement that "private sector engagement is about more than just consultation".

One of the tensions between developing and industrialised countries over the GCF is where the $100 billion/year by 2020 promised to poorer countries in Copenhagen will come from. Developing countries expect money to come from governments while most industrialised countries expect the private sector to provide it.

The target for industrialised countries to provide developing countries with climate finance of $100 billion a year by 2020 was set out at the Copenhagen climate conference in 2009.

Since then, the IMF and the UN's AGF group have been developing ideas of where this money could come from, and this latest paper builds on those ideas.

Defining climate finance as "resources to catalyse low-carbon and climate-resilient development", the report notes that both public and private flows are indispensable to meeting the $100 billion/year target.

Ways of raising financing highlighted in the report include:

- Removing fossil fuel subsidies, which amounted to $40 billion-$60 billion/year in 2005-10, citing OECD research. The report notes that if 20 per cent of the subsidies could be redirected to public climate finance, it could yield $10 billion/year
- A $25 per tonne price on CO_2 emissions in industrialised economies (principally the EU, US, Canada, Australia and Japan) could raise $250 billion in 2020, while cutting CO_2 emissions by 10 per cent compared to a baseline scenario. Allocating 10 per cent of that for climate finance could meet a quarter of the requirement
- Financing from the carbon offset market could range from $5-40 billion/year in 2020, "depending on the level of ambition with which countries implement national mitigation targets".

The draft plan, which could be adopted at the G20 summit in Cannes, France, in November, refines proposals last year by UN advisers on how to meet the $100 billion target. The pledge would form part of a new global accord on climate change.

The G20 summit will set the stage for a resumption of negotiations on a climate pact in Durban.

Norway and Australia recently put forward a proposal to finalise a new international climate framework by 2015.

The proposal, submitted to the UN Framework Convention on Climate Change secretariat, maps out a time-table of what needs to be agreed and by when, starting with the negotiations in Durban and culminating in 2015, when a legally-binding framework could be adopted.

Jennifer Morgan, director of the climate and energy programme at the World Resources Institute in Washington, DC, USA said: "It's the first formal proposal with this type of a mandate to lead to a legally-binding instrument."

Alstom-Datang agreement gives impetus to CCS

- China starting to show CCS leadership
- Two CCS projects for enhanced oil recovery

A recent agreement between Alstom and China Datang Corporation highlights China's increasing ambition to take leadership in the deployment of carbon capture and storage (CCS).

In September the two companies signed a Memorandum of Understanding (MoU) to form a long-term strategic partnership and jointly develop two CCS demonstration projects located in China's two biggest oilfields Daqing, Heilongjiang province and Dongying in Shandong province.

Under the MoU, Datang will be the host of the projects, while Alstom will be the technology supplier and be involved in the implementation of the projects.

While many see CCS as an essential technology in the global drive to cut CO_2, its speed of development has slowed in North America and Europe due to financial, regulatory and public acceptance challenges.

Leigh Hackett, Vice President of Business Development for Alstom's CCS business said: "The initial euphoria has been tempered somewhat but China is really putting a marker in the ground and is starting to show leadership in developing CCS projects. The MoU is a significant development through which we will be demonstrating two of our technologies in the Chinese market. There is a real chance that with these projects, China will be on a faster track to commercialisation than most other markets."

The MoU could potentially have an impact around the globe. It was announced at the Carbon Sequestration Leadership Forum in Beijing, attended by key governmental and corporate energy decision makers. It represents the culmination of high-level discussions between France and China on climate change, which began in 2007.

Under the MoU, two 350 MW coal fired power plants are being built at Daqing, one of which will be equipped with Alstom's oxy-firing technology. A 1000 MW coal fired power plant is being planned at Dongying and this will be fitted with one of Alstom's post-combustion capture technologies – chilled ammonia or advanced amines.

"Which of the post-combustion technologies will be selected is still in discussion. It will be a few months before we decide exactly which technology we will apply," said Hackett.

Both CCS projects are scheduled for operation in 2015. Once completed, they will each be able to capture more than 1 million tonnes of CO_2 annually, which will be used for enhanced oil recovery (EOR).

The use of CO_2 for EOR is seen as a distinct driver for the projects. "It is no coincidence that these projects are in an EOR location. People are talking more about CCUS as opposed to CCS, with the 'U' being usage. Generating a revenue stream or creating value for the CO_2 helps make it financially viable. It will be one of the things that will receive more focus as the technology develops in the future," said Hackett.

Energy consumption to grow by 53 per cent by 2035

The world's energy consumption will increase by 53 per cent, from 505 quadrillion Btu (British thermal units) in 2008 to 770 quadrillion Btu in 2035, the Energy Information Administration (EIA) said in the *International Energy Outlook 2011*. Average annual growth of world energy consumption will be 1.6 per cent from 2008 to 2035.

It said energy demand in OECD economies will grow slowly over the projection period, by an average annual rate of 0.6 percent, whereas energy consumption in non-OECD emerging economies will expand by an average of 2.3 per cent per year.

"Energy use in non-OECD Asia shows the most robust growth of all the non-OECD regions, rising by 117 per cent from 2008 to 2035," the EIA report said.

According to a new Vital Signs Online article from the Worldwatch Institute, global energy intensity increased by 1.35 per cent in 2010, reversing a broader trend of decline over the last 30 years.

Energy intensity, defined as total energy consumption divided by gross world product, has been growing faster than the global economy for the past two years, even though energy intensity overall has declined over the past decade.

The article highlights reasons for these changes in emerging economies and industrialised countries, including China and the US, and predicts that global energy intensity will return to an overall decline over the long term as economies opt for more sustainable development.

Brazil auctions squeeze margins


Changing landscape: Brazil is increasing its thermal and renewables capacity

- Wind bids lower than natural gas
- Court halts Belo Monte

Siân Crampsie

Low prices submitted in bids in Brazil's latest energy auctions illustrates the fierce level of competition between developers on the market.

The August auctions were held by Brazil's national energy agency EPE and awarded concessions for some 51 energy projects with a total capacity of 3.9 GW.

EPE said the auctions demonstrated that wind power could compete directly with natural gas. However, market observers have expressed concerns that wind developers would struggle to make a profit from the low prices.

Developers of 44 wind farms bid an average of R$99.58/MWh ($62.24/MWh) for their projects – lower than the average R$103.26/MWh price bid for the two natural gas projects on offer.

One hydropower project came in at R$102/MWh and four biomass projects averaged R$102.41/MWh.

In a second auction for 1.3 GW of reserve capacity that excluded natural gas, 34 wind farm developments achieved an average bid price of R$99.54/MWh.

The bids for wind projects in this auction were around 24 per cent lower than those generated by a similar auction held last year, said EPE.

US company GE said that it secured $800 million of commitments for its wind and gas turbines from the auctions. It said that it won all of the natural gas power generation commitments and would be supplying 7FA gas turbine combined cycle technology for more than 1 GW of projects.

In addition, it received commitments for at least 378 MW of its 1.6 MW wind turbine technology. "Our latest 7FA gas turbines and advanced 1.6 wind turbines represent very cost-effective electricity solutions in the transparent and competitive Brazil energy auctions, in which all of the major global OEMs participated," said Steve Bolze, president and CEO of GE Power & Water.

Brazil holds energy auctions as its main procurement mechanism for new capacity. It relies heavily on hydropower but is attempting to diversify its generation mix into thermal capacity and renewables.

Its Energy Ministry says that the country needs to increase its electricity generation capacity by 50 per cent over the next ten years. Energy Minister Edison Lobao recently reaffirmed the country's commitment to nuclear energy and reiterated plans to build four more nuclear units.

In September a key hydropower project under development in Brazil was struck a blow when a court ordered construction to stop.

The 11 GW Belo Monte dam is an important element of Brazil's Accelerated Growth Programme (PAC) and will be the third largest hydropower plant in the world when complete. It is being developed by a consortium led by Brazilian energy group Chesf, which earlier this year awarded major supply contracts to Alstom, Andritz and Voith.

The Brazilian judge has barred any work taking place that would interfere with the natural flow of the Xingu River. The ruling is a major victory for anti-dam campaigners.

The consortium building the $11 billion dam is expected to appeal the decision. Brazilian environment agency Ibama says that the project has been the subject of rigorous analysis of its environmental impact.

EPA rules draw debate on policy

The USA needs to boost its green energy credentials if it wants to get ahead of countries like Germany and China in the 21st century, according to US Vice President Joe Biden.

Speaking at the National Clean Energy Summit, Biden's remarks came as utilities in the USA continued their heated debate over proposed rules to curb pollution from coal fired power plants.

The rules are intended to reduce the damage to public health from industrial pollution sources such as coal fired power plants but they have caused uproar because of the financial impact they will have on utilities.

The release of a second set of proposed rules from the US Environmental Protection Agency (EPA) governing emissions of greenhouse gases from power plants has been delayed.

The proposed rules have put the EPA under huge pressure and led to legal actions as well as several pieces of legislation being put forward in Congress to curb the EPA's powers.

Meanwhile proponents of clean energy continue to call for a coherent, long-term energy policy in the USA that will support renewable energy development.

Biden called for action to be taken to help the US reduce its dependence on foreign oil. "Can anyone imagine us leading the world in the 21st century with the same energy policy we have today?" Biden said during his keynote speech. "If we shrink from deciding whether we are going to lead in the area of alternative energy, renewable energy, then we will be making the biggest mistake that this nation has made in its history."

A bipartisan group of state governors has written to President Barack Obama asking for the production and investment tax credits for wind power to be extended by at least seven years.

The tax credits for wind are scheduled to expire at the end of next year, but Congress should extend them immediately, according to a letter signed by the 24-member Governors' Wind Energy Coalition. Failure to extend them will result in a slow-down in the wind manufacturing sector, said the coalition.

The first new proposed regulation is the Cross-State Air Pollution Rule (CSAPR), which cut emissions of sulphur dioxide and nitrogen oxides. It was set out in July and would take effect at the start of 2012. Operators of coal-fired power plants will have to invest in flue gas desulphurisation equipment, burn low-sulphur coals, buy pollution permits in trading schemes, or close down ageing plant.


Not so clean: rules are needed to curb pollution from coal plants

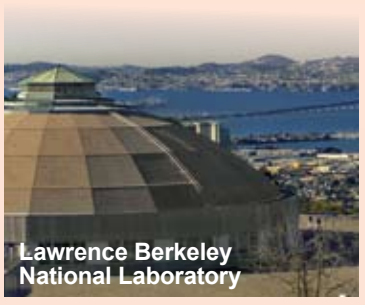
Utilities such as Southern Company, AEP and Duke Energy could be hard hit, say analysts. Opponents of the rules say that the US risks power cuts and increased energy prices by implementing the regulations.

AEP said in June that the new regulations could cost it $6-8 billion before the end of the decade, and that it planned to close five coal fired plants. Several companies have asked the EPA to delay the implementation of the rule.

Suntracker sees falling PV prices

- Consolidation, failures likely
- PV more competitive

A report from the US Department of Energy's Lawrence Berkeley National Laboratory showing a drastic drop in prices of solar energy systems shows that solar power is becoming increasingly competitive.


Lawrence Berkeley National Laboratory

The report shows that the average pre-incentive cost of residential and commercial solar photovoltaic (PV) systems decreased 17 per cent in 2010, the most significant annual reductions since Lawrence Berkeley National Lab began tracking data. Costs declined another 11 per cent in the first half of 2011.

"Solar is ready to play a significant role in our nation's energy economy," said Carrie Hitt, President of the Solar Alliance, a state-focused alliance of solar manufacturers, integrators and financiers. "It's reliable, it's scalable, it's safe, and now we're seeing that it's cost-competitive with conventional electricity resources in many parts of the country."

The report called *'Tracking the Sun'*, examined more than 115 000 PV systems installed between 1998 and 2010 across 42 US states. It also concluded that reductions in the cost of installation labour, balance of systems, overhead and other non-module costs fell 18 per cent from 2009 to 2010.

Falling costs in the solar energy industry have led to consolidation in the market and the much publicised failure of high profile manufacturers such as Solyndra, Evergreen Solar and SpectraWatt.

The fall in solar systems prices has been driven largely by competition in the market because of an oversupply of modules. Further bankruptcies, particularly of manufacturers, are likely to be seen, say analysts.

The falling prices have forced other manufacturers to move downstream into project development and sideways into thin-film solar modules and concentrating solar power (CSP) technology.

Colombia, Panama ink power line deal

Central America's power network is to be strengthened with the construction of a new electricity line between Colombia and Panama.

Colombian energy and mines minister Carlos Rodado said in an interview on Colombian television that the two countries will jointly invest $420 million in the project and that the line could eventually be extended beyond Panama into Costa Rica and other parts of Central America.

The line, which will start in the northern part of Colombia, will be financed equally by Panama and Colombia under an accord signed by the two countries' utilities, Etesa and ISA. It will allow Colombia to export excess hydropower to Panama, said Rodado.

New Japanese PM focuses on Fukushima

Ending the Fukushima crisis and outlining a new energy policy is top priority for Japan's new cabinet, writes **Syed Ali.**

Japan's new Prime Minister, Yoshihiko Noda, made his international debut as premier in New York, noting that Japan will present the specifics of its new medium and long term energy policy next summer.

The prime minister informed UN Secretary General Ban Ki Moon and other world leaders of the latest Japanese estimates showing that the amount of radioactive substances being released from the damaged Fukushima Daiichi reactors has fallen to around one-four millionth of the level at the early stage of the crisis.

Noda, who took office at the start of September, said Japan is aiming to bring the reactors into a state of cold shutdown by the end of this year, one month ahead of the initial target.

Noda also said Japan is ready to continue to export its technology and expertise to emerging economies seeking to introduce nuclear facilities. Last month Japanese diplomats said Indian Prime Minister Manmohan Singh urged Japan to speed up negotiations on a bilateral nuclear energy agreement that has stalled since the March 11 earthquake and tsunami in Japan.

At the same time Japan is to step up its efforts in expanding the use of renewable energy. According to a report compiled by Greenpeace International and the Tokyo-based Institute for Sustainable Energy Policies (ISEP), Japan could phase out nuclear power by the end of next year and generate 43 per cent of its electricity by 2020 from renewable energy.

To meet these goals, Greenpeace and ISEP called on Japan to reduce electricity demand by 1.7 per cent a year on average between now and 2020. Other proposals are to use more liquefied natural gas.

The report calls for an emphasis on wind and solar power. This includes official policies to increase the average annual wind power market from about 220 MW in 2010 to around 6000 MW by 2020, and increasing solar photovoltaic capacity from 990 MW to 6700 MW during the same period.

New Environment Minister Goshi Hosono has vowed to reduce Japan's reliance on nuclear power but says that halted reactors that pass stringent safety tests may be restarted if the nation's energy needs are not being met.

Hosono, who is doubling as state minister in charge of handling the Fukushima crisis and compensation issues, added there is a need to separate discussions about short-term energy needs and long-term policy.

"I've been suspicious of the nuclear policy we have had, especially after

New at the helm: Prime Minister, Yoshihiko Noda

March 11. I don't intend to allow the reactors to be restarted one after another. I'm going to step on the brakes," Hosono said during his first news conference in early September.

Hosono is the youngest minister in Noda's fledgling Cabinet. He became a special adviser to former Prime Minister Naoto Kan and served as a link between the central government and Tokyo Electric Power Co. (Tepco) when the crisis began at the Fukushima Daiichi No. 1 nuclear power plant.

He is tasked with ensuring that the reactors reach a cold shutdown and that decontamination efforts are successful. He is also in charge of creating a compensation plan for those affected by the nuclear accident.

Hosono will be overseeing the establishment of a new agency affiliated with the Environment Ministry to regulate nuclear plants. The current setup of the nuclear safety agency, under the Ministry of Economy, Trade and Industry, has been criticised for being too lapse in enforcing regulations.

Noda, who took office and installed a new Cabinet on September 2nd has already seen the resignation of his trade minister, Yoshio Hachiro, who stepped down following a remark seen as insensitive to nuclear evacuees. Noda, Hachiro and other government ministers were visiting the Fukushima Daiichi nuclear power plant when Hachiro called the desolate evacuation zone around the plant "a town of death".

Last month Tepco said it will put Yen2379 million ($31 million) into a new entity set up to help the utility pay compensation to individuals and businesses claiming damages caused by the nuclear plant disaster.

The body will also receive Yen7 billion in public funds as well as a total of Yen7 billion from the country's 12 nuclear plant operators. The 11 other power companies will pay into the entity because it is meant to serve as a compensation scheme for future accidents. The percentage of their contributions is fixed in proportion to the power output of their plants.

Developers see Philippines renewables opportunities

- JV to invest in 1000 MW of wind
- Solar plant to serve Metro Manila

Developers are taking advantage of opportunities to develop renewable power projects in the Philippines.

Greenergy Holdings Inc. has entered into an agreement with Chinese firm Tianjin Tianbao Investment and Development Corp. (TTIDC) that will result in energy investments worth $1.3 billion. The deal also involves the formation of a joint venture company, details of which were not disclosed.

In a report, Greenergy said the joint venture would develop wind energy projects with a total generating capacity of 1000 MW calling for an estimated investment of at least $1.3 billion within a 10-year period.

In the first two years alone, the priority of the joint venture is "to invest up to $200 million in wind energy projects," Greenergy said.

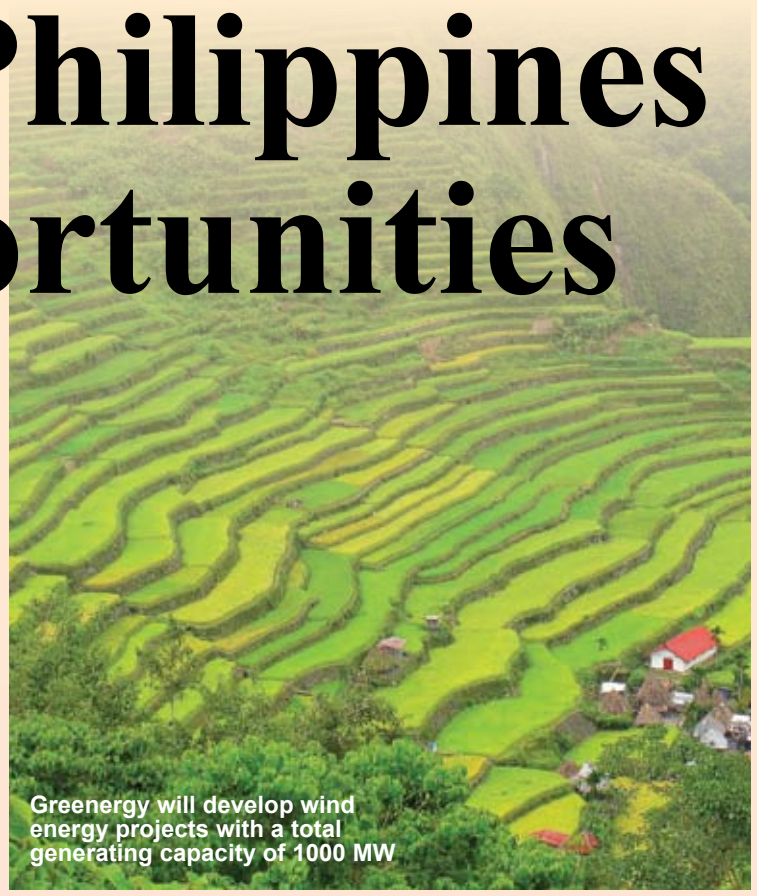
"The parties shall plan the establishment of the first turnkey project, a 49.5 MW wind energy project composed of 33 units of 1.5 MW wind mills which is intended to be operational within one year from the time the joint venture vehicle is established," it added.

In addition to wind energy, the joint venture is also open to making investments in other renewable energy projects such as biomass, solar, hydro and geothermal.

At the end of August, ATN Philippines Solar Energy Group Inc., a joint venture between ATN Holdings Inc. and Transpacific Broadband Group International Inc. said it will be investing P5.676 billion ($132 million) for a 30 MW solar power project in Montalban Rodriguez, Rizal.

ATN is targeting to serve Metro Manila, particularly the peak demand of malls in the high growth business districts of Quezon City.

It can also sell electricity directly to end users under the Wholesale Electricity Sport Market (WESM) set-up. It may also negotiate with the National Power Corp. as primary off-take customers that will distribute power through the Transeco.



Greenergy will develop wind energy projects with a total generating capacity of 1000 MW

Indian power utility steps into Sri Lanka

In its first venture overseas, India's largest power generation utility NTPC inked a contract with the Ceylon Electricity Board (CEB) to set up a coal fired power plant in Sri Lanka.

The plant to be built in Sampur, Trincomalee will have a capacity of 500 MW from two 250 MW units. There is also the possibility to increase the capacity by a further 500 MW.

NTPC said in a statement that the project will go on stream by 2016 and would help in meeting the rising demand for power in Sri Lanka.

Under the agreement, Sri Lanka is to provide 500 acres of land and other facilities including water for the project, the Energy Ministry said. Coal for the project will be imported and supplied by Lanka Coal Company.

Sri Lankan Power and Energy Secretary M M C Ferdinando estimated the total cost of the project to be $500 million but NTPC said it anticipates the costs to be in the region of $700 million.

The CEB and NTPC will bear 30 per cent of the investment costs. The remaining 70 per cent of the financing is to be generated through external sources.

The Indian government has offered a concessionary line of credit of $200 million to Sri Lanka enabling the country to fulfil its commitments under the agreement including the construction of a jetty at Sampur and transmission lines, Indian High Commissioner in Sri Lanka, Ashok Kantha said.

Sri Lankan Minister of Power and Energy told *Xinhua* that the Sampur coal power plant will be the last thermal power plant to be built in Sri Lanka until 2025.

Australia likely to pass clean energy legislation

Australia is likely to soon pass a Clean Energy Plan recently submitted to Parliament that will form the strategy for reducing the country's CO_2 emissions.

Last month the government introduced a package of bills to Parliament that will support the transition to a clean energy future. The bills implement the key elements of the government's Securing a Clean Energy Future Plan announced in July.

The Clean Energy Plan – made up of 18 Clean Energy Bills and the Steel Transformation Plan Bill – has four key elements. It will put a price on carbon pollution, promote investment in renewable and clean energy technologies and support action to reduce carbon pollution, improve productivity and sustainability in the land sector.

Speaking from Australia House in London, industry expert Nathan Dale, a founding partner at Brokers Carbon, said: "The Carbon Funds Initiative was passed on August 23rd and will start from December 1, this year. The package sits in the Law House on October 12th and is tabled in the Senate on November 7. The people voting on it will be the same people that voted on the Carbon Funds Initiative. So the odds are that it will get through this time."

If the legislation is passed in the coming weeks, it will come into effect in July 2012. It will be Australia's third attempt at passing legislation on an Emissions Trading Scheme.

Australia has made an un-conditional commitment to reduce its CO_2 levels by 5 per cent by 2020 compared to 2000 baseline levels.

Research by carbon analytics firm, RepuTex, reveals that emissions from Australia's power industry dropped 3.63 per cent in August compared to July, with RepuTex's month-on-month emissions forecast projecting a further fall of 5 per cent through September.

Power plants will boost Sabah

Petronas, the Malaysian national oil corporation is spearheading two power projects that will boost Sabah's electricity supply by 600 MW.

Daud Abdillah, former deputy general manager of Sabah Electricity Sdn Bhd (formerly Sabah Electricity Board) said the construction of two multi-billion ringgit power plants in Kimanis and Lahad Datu will make Sabah a more attractive investment destination.

"The extra energy capacity not only will help Sabah to become an attractive place for investments but most importantly, will provide electricity supply security to the state," he said.

The RM1.5 billion ($475.2 million) Kimanis Power Plant will be operational in 2014 while the Lahad Datu Power Plant, costing RM2.2 billion, will be completed in 2015 and will include a liquefied natural gas (LNG) re-gasification terminal to provide natural gas feedstock.

Both the power plants will get their feedstock from the Sabah Oil and Gas Terminal, which is also being developed by Petronas.

Daud said the additional capacity, expected to come on stream within the next three to four years, would not only stabilise power supply within the state but also provide power to rural areas.

China moves on air pollution

Thermal power plants in China will soon operate under tighter emission controls under new standards to tackle air pollution. Efforts to improve air quality will also be boosted by new targets aimed at reducing energy consumption.

The new rules on emissions, which will take effect on January 1, 2012, place tougher restrictions on air pollutants and will replace standards that were introduced in 2003. Pollutants targeted include sulphur dioxide, nitrogen oxide and soot, major contributors to acid rain and, for the first time, mercury.

Average air quality in 45 major cities across China was rated as "poor" in the first half of this year, according to statistics.

Wu Xiaoqing, deputy environment minister said: "With the new standards, the thermal power industry alone will have to slash 5.8 million tons of nitrogen dioxide and 6.18 million tons of sulphur dioxide by 2015."

The new standards will result in a substantial increase in pollution-treatment costs for power plants and has been strongly opposed by electricity companies. About Yuan260 billion ($40.7 billion) needs to be invested on upgrading industrial facilities to meet the standards, the Chinese Ministry of Environmental Protection predicted.

Greenpeace welcomed the decision. Ms. Zhou Rong, a climate and energy campaigner with Greenpeace, said. "We're pleased to see the result. But if the new standards are to be observed the ministry needs to publish a specific plan of action." It is equally important to reduce coal consumption and switch to clean energy, such as solar and wind power, Zhou added.

Li Zheng, dean of thermal engineering at Tsinghua University in Beijing, also warned that coal consumption was not limited to huge power plants. He said small-scale boilers, such as those used for heating during the winter, should also be targeted "otherwise the effect of the new standards will be watered down".

By the end of 2010, China's total electricity generation capacity reached 962 GW. About 73 per cent of this comes from thermal power plants that consume 1.6 billion tons of coal annually.

In an effort to reduce coal consumption China also announced a plan to cut energy consumption per Yuan10 000 ($1563) of gross domestic product by 16 per cent in 2015 from the level last year. The target represents a 32 per cent decline from the 1.276 billion tonnes of coal equivalent of energy consumption in 2005, according to the plan. By 2015, China will have saved 670 million tonnes of coal equivalent, the plan said.

To meet the goal, the government will rein in excessive growth in high energy consuming and high polluting industries and accelerate the closure of outdated industrial facilities during the period, the statement said.

China will strictly control approval of new projects in energy-consuming and polluting sectors and those with over-capacity. Polluting industries and sectors with outdated production are prohibited from moving to the central and western regions of the country, the statement said.

Air pollution is a problem in many of China's major cities

Court suspends nuclear fuel tax

Germany's controversial nuclear fuel tax falls at the first hurdle, writes **Siân Crampsie.**

Looking for closure:Germany will close all of its nuclear power plants

Germany's utilities have won a victory in their legal challenge to the government's nuclear fuel tax.

The Hamburg Tax Court has rejected the tax as unlawful and has ordered the suspension of nuclear fuel tax collections.

It has also granted a request from one of Germany's four nuclear utilities for €96 million to be refunded by the government.

The tax was implemented as part of a deal struck by the four utilities – E.On, EnBW, RWE and Vattenfall – and the government to extend the lives of Germany's nuclear power plants.

That extension plan was scrapped in the wake of the Fukushima accident when Germany announced that it would phase-out the use of nuclear energy, but the government told the utilities that they would have to continue to pay the tax. EnBW was the first of the utilities to launch legal action against the government, claiming that the tax was unconstitutional and contrary to European law.

The German government is likely to challenge the latest ruling by the court in Hamburg, which expressed "serious doubt" that the fuel tax is compatible with the German constitution.

All of the nuclear generators are seeking compensation for being forced to close down eight nuclear reactors after the Fukushima accident in March. The utilities say that the cost of this – and of the early closure of the country's other reactors – will amount to billions of euros.

Michael Kruse, Principle at consultancy firm Arthur D. Little, believes Germany's four operators of nuclear power stations will face a bill of €18 billion for decommissioning the country's reactors.

Kruse says that the reason for these high costs is because the cost of storing nuclear waste produced during the lifetime of the 17 facilities are excluded from estimates, and operators will incur this problem until these power plants are demolished and disposed of.

"The nuclear phase-out in Germany leaves the utilities and service providers with a difficult task," says Kruse.

Germany's decision to phase-out the use of nuclear energy has raised concerns that it will not be able to meet its energy needs, or that it would end up importing significant quantities of energy generated by nuclear power plants in France.

The shutdown of eight of the country's oldest nuclear plants appears to have already had an economic impact on Germany by reducing energy production in the country by nearly nine per cent in the second quarter.

Exports of electricity from Germany have also virtually stopped. However, the Federal Network Agency says that Germany has enough spare conventional generating capacity to get through the winter without having to reactivate one of the eight closed nuclear plants.

Germany's utilities can also see the economic opportunity resulting from the altered energy policy and have started making plans to boost renewable energy capacity.

RWE said last month that it was planning to embark on an investment programme in the North Rhine-Westphalia (NRW) area, boosting wind and biogas capacity in former mining areas.

Dr Johannes Lambertz, CEO of RWE Power said: "We are planning to use reclamation areas from opencast mining as sites for wind energy projects and, in cooperation with regional farmers, use plant cultivation areas to generate biogas."

Prof. Fritz Vahrenholt, Chairman of the Board of Directors at RWE Innogy added: "In NRW, RWE Innogy operates around 120 MW based on renewables. We are hoping to almost triple this figure by around 200 MW to 300 MW over the next three years. By 2020, we are expecting to reach a total of 500 MW.

"We are not wasting any time and are starting with three specific projects in the wind and biogas segments."

UK shale gas estimates "conservative"

Reserves of shale gas in the UK could be much higher than previously thought in light of the results from three exploratory wells in the northwest of the country.

Cuadrilla Resources has been drilling in Lancashire and says that its license area alone holds enough gas in place to supply Britain's entire annual gas requirements for more than 56 years.

In reality only around 10-20 per cent of this gas is actually recoverable, but the findings mean that the British Geological Survey's original shale gas reserve estimate of 150 billion m^3 are very cautious.

The findings have also heightened the level of opposition in the UK to shale gas drilling, which is done with a controversial technique known as hydraulic fracturing, or 'fracking'.

Environmentalists believe that fracking – which entails the injection of large quantities of water laced with chemicals into rock formations – can contaminate water supplies. There have been protests against Cuadrilla Resources' activities in the UK, and opposition is also mounting in South Wales, where two companies – Eden Energy and Coastal Oil and Gas – have applied to drill exploratory wells.

Cuadrilla's reserve estimates for its license block are the first to arise from an actual drilling campaign. The company says that its techniques are tested and safe.

It is now planning to drill more exploration wells in order to determine how much gas could be extracted, and will decide next year whether to proceed to the production stage.

The discovery of large reserves in the UK – and elsewhere in Europe – raises the prospect of reducing energy prices, reducing greenhouse gas emissions and improving energy security, according to shale gas proponents. Exploration has already started in other countries in Europe.

Digging deep: Cuadrilla is now planning to drill more exploration wells to determine how much gas could be extracted

Poland has awarded over 90 licenses for exploration of shale gas and is thought to have the largest reserves in Europe.

Germany, Italy below solar par

Europe's booming solar energy sector is under threat because of declining demand in key markets, according to research firm Collins Stewart.

Growth in the market in recent years has been significant because of the favourable policy environment and declining prices for solar panels and components.

However, changes to government policies as well as poor macro-economic conditions and challenging financing conditions have brought significant challenges for manu-facturers and developers, says Collins Stewart.

The report shows that demand in Germany has been below expectations this year and that construction in Italy has been difficult to arrange. It comes as a new report from the European Photovoltaic Industry Association (EPIA) indicates that solar photo-voltaic (PV) technology could reach grid parity in key European markets as early as 2013.

EPIA's report shows that PV prices are set to drop further and that the PV sector will rely less on feed-in tariffs and direct government subsidies in the coming years. However, if the sector is to achieve grid parity, EPIA warns, governments will still need to commit to "regulatory frameworks that support development of the technology and removal of market distortions".

In August the International Energy Agency said that PV and solar thermal plants could meet most of the world's demand for electricity by 2060.

Pressure mounts on UK utilities

Concern over rising energy bills has forced several major UK energy utilities to offer themselves up for investigation by the country's competition authorities.

RWE npower, E.On UK and EDF Energy have all joined consumer groups in calling for an inquiry by the Competition Commission in order to achieve clarity and give consumers confidence in their pricing.

The move comes after several major price increases by the UK's 'big six' energy companies in recent weeks. Energy Secretary Chris Huhne has challenged them to make their pricing structure more simple and billing clearer.

"We want simpler tariffs, requiring energy companies to tell you whether you could buy more cheaply on another tariff," said Huhne after announcing a raft of new powers for the regulator, Ofgem, aimed at tackling "predatory pricing" tactics.

Huhne believes that energy companies keep existing customers on tariffs that are not necessarily the best option for them, and use the profits to lure new customers with cheap deals.

The debate has raised the wider question of the impact that large levels of investment in renewable energy and grid infrastructure will have on energy bills. Manufacturing association EEF recently said that the government's proposed carbon floor price would have negative economic impacts for the UK.

■ RenewableUK has welcomed figures showing that generation of electricity by wind turbines in the UK reached a new record high on September 6 with 3021 MW or 7.2 per cent of demand.

Iran connects Bushehr to grid

- Agreements with Turkey, Russia
- IAEA adopts safety action plan

Bushehr: Iran's first nuclear power plant

Iran is hoping to cement relations with Russia after completing construction of the Bushehr nuclear power plant.

Iranian state radio reported in September that Iran's first nuclear power plant has been connected to the grid and started generating electricity in a test run.

The 1000 MW plant has been completed by Russian engineering firm AtomStroyExport and Iran announced later in September that it had reached agreements with both Russia and Turkey on the construction of more power plants in the country.

Under the apparent agreements, both Russia and Turkey would make investments in Iran's electricity sector and would also share technical experiences.

Bushehr was scheduled to start operating in early 2011 but has suffered a number of setbacks. Operation of the power plant marks a major milestone in Iran's nuclear energy programme, which the USA and other Western countries fear will form the basis of a nuclear weapons programme.

Iran's nuclear energy programme is being monitored by the International Atomic Energy Agency (IAEA), which recently said that it was increasingly concerned that Iran is working on producing components for a nuclear weapons programme.

The IAEA says "many member states" had provided evidence for its latest assessment on Iran's nuclear ambitions.

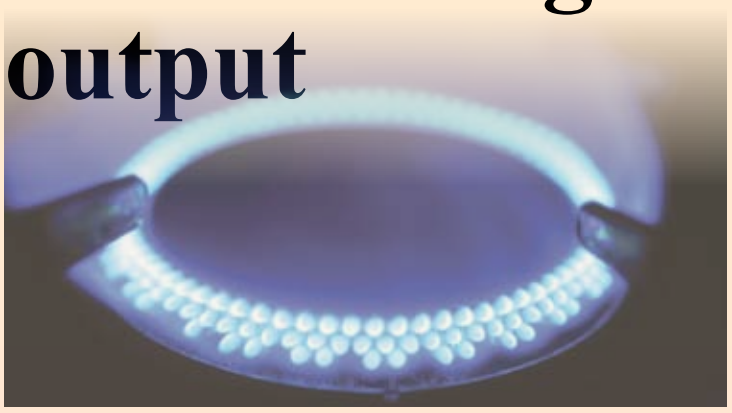
Extracts of the report, published by the AFP news agency, said the IAEA was "increasingly concerned about the possible existence in Iran of past or current undisclosed nuclear related activities involving military related organisations".

Meanwhile, the IAEA also sought last month to raise safety levels and boost public confidence in nuclear energy by adopting a new action plan and establishing a nuclear safety action team to drive the plan forward.

The 12-point action plan was drawn up in the wake of Japan's Fukushima disaster and calls on governments to establish emergency teams to respond to major nuclear accidents around the world. IAEA Director General Yukiya Amano said: "With this plan, we will move from the planning phase to the implementation phase. Firm and sustained commitment from all member states is needed for the full implementation of the action plan.

"It will take rapid and visible improvements in nuclear safety – not just good intentions – to restore public confidence in nuclear power. The agency will play its central part with vigour."

Ukraine deals set to boost gas output



- Oil majors seek shale gas opportunities
- Energy firm restructured

Siân Crampsie

Ukraine has made an important step forward in improving its energy security with an agreement between Royal Dutch Shell and Ukrainian public company Ukrgazvydobuvannia to explore and extract shale gas.

The two companies will start their cooperation by drilling wells in the Dnipro-Donetsk basin to determine the presence of shale gas. The agreement also covers exploration of conventional gas reserves.

The deal could lead to $800 million of investment in Ukraine's energy industry and help Ukraine to cut gas imports from Russia, with which it has had a series of disputes in recent years over gas prices.

In August, Ukraine said it would launch a shale gas licensing round and international oil and gas giants have been lining up to participate. As *TEI Times* went to press, ExxonMobil announced the signing of a cooperation deal with Ukraine's Naftogaz Ukrainy to study the country's shale gas potential.

Ukraine is thought to have substantial untapped reserves of unconventional gas. The US Energy Information Administration estimates that its recoverable shale gas reserves stand at 1.2 trillion cubic metres.

The Ukrainian government is also restructuring state energy firm Naftogaz and in September approved the sale of shares in Naftogas spin-off companies.

The companies will be sold by IPO and the sales are expected to raise $10-12 billion, according to Energy Minister Yury Boiko.

Ukraine will use the income to fund energy efficiency projects and fund growth in the natural gas sector.

Exxon seals coveted Arctic deal

Oil major ExxonMobil has trumped rival BP with the creation of a strategic partnership with Russia's Rosneft to explore for hydrocarbons in the Arctic.

The $3.2 billion agreement was labelled as a "significant strategic step by both companies" by Exxon Chairman and CEO Rex Tillerson. It illustrates the importance of the large, untapped Arctic reserves to the global oil industry and the recognition by Russia that it needs foreign investment and expertise to exploit them.

The deal comes just a few months after the collapse of a proposed Arctic exploration agreement between Rosneft and BP. It will involve the exploration of offshore blocks in the Arctic Kara and Black seas – including three that would have been part of the BP-Rosneft agreement.

The deal will also see the state-controlled Russian group take minority stakes in projects in the US Gulf of Mexico, Texas and elsewhere. Rosneft president Eduard Khudainatov said that the agreement would turn the company into "a global energy leader".

"We have a clear vision for Rosneft's strategic direction – building world-class expertise in offshore business and enhancing oil recovery," said Khudainatov, following a signing ceremony in the Black Sea resort of Sochi. "The partnership between Rosneft with its unique resource base, and the largest and one of the most highly capitalised companies in the world reflects our commitment to increasing capitalisation of our business through application of best-in-class technology, innovative approach to business management, and enhancement of our staff potential."

Tillerson said ExxonMobil would benefit Russian energy development by working closely with Rosneft. "This large-scale partnership represents a significant strategic step by both companies," said Tillerson. "This agreement takes our relationship to a new level and will create substantial value for both companies."

The agreement also provides for constructive dialogue with the Russian government concerning the creation of a fiscal regime based on global best practices. The two companies will also create an Arctic Research and Design Centre for Offshore Developments in St. Petersburg, which will be staffed by Rosneft and ExxonMobil employees.

The centre will use proprietary ExxonMobil and Rosneft technology and will develop new technology to support the joint Arctic projects, including drilling, production and ice-class drilling platforms, as well as other Rosneft projects.

BP's proposed deal with Rosneft had included the creation of a similar technology centre. However, the deal foundered after the British firm's existing Russian partners – Alfa Access Renova – said that the deal breached the terms of its shareholder agreement with BP.

Jordan, UAE committed to nuclear

Middle Eastern countries have reaffirmed their commitment to building nuclear power plants.

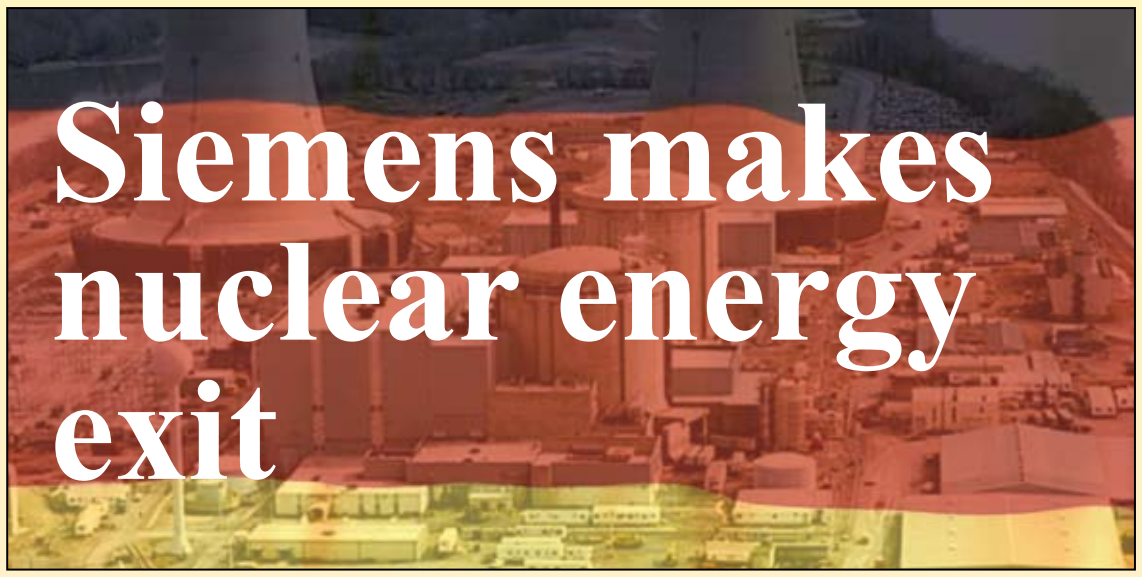
Jordanian Minister of Energy Khalid Touqan said that completion of the country's fledgling nuclear energy programme was necessary for the accomplishment of its strategic water and energy projects.

Meanwhile the Energy Minister of the UAE, Mohamed Bin Dhaen Al Hamli, says that his country will not change its nuclear energy ambitions because of the Fukushima nuclear incident.

"We have a lot of oil and gas, but we must renew and diversify, including into nuclear energy," said Al Hamli at the World Economic Forum (WEF) Annual Meeting of the New Champions in Dalian, China. "We are fortunate that we are in the inception stage and can incorporate the latest safety features. Just because of Fukushima, we cannot condemn an entire industry."

According to Touqan, nuclear energy is Jordan's only option for operating water desalination plants and a proposed canal linking the Red Sea and the Dead Sea.

The Jordan Atomic Energy Commission (JAEC) is considering bids from three short-listed groups vying to build a 1000 MW nuclear reactor by the end of the decade.



Siemens makes nuclear energy exit

Siemens says it has closed the chapter on nuclear power and its ambitions to form a nuclear partnership with Rosatom following the German government's decision to close down the country's nuclear power plants.

The German engineering firm has terminated discussions with Russian nuclear energy giant Rosatom over the creation of a joint venture but says that it will continue to supply steam turbines to the global nuclear power sector.

Its decision illustrates the level of public opposition to nuclear energy in Germany.

The proposed joint venture was announced by Rosatom and Siemens over two years ago and was intended to make Siemens a world leader in nuclear energy. Siemens says that it still sees Russia as a key growth market for its power business.

It also wants to work with Rosatom in other fields, including nuclear medicine.

"The chapter is closed for us," Peter Löscher, chief executive, told *Der Spiegel* in September. "We are no longer going to participate in [the business of] taking responsibility for building nuclear power stations or financing them."

He said that the decision was in direct response to Germany's decision to close its 22 nuclear power stations by 2022 and focus on green energy.

Siemens and Rosatom signed a memorandum of understanding in 2009 following Siemens' decision to pull out of its nuclear joint venture with Areva, Areva NP.

Discussions between Rosatom and Siemens were put on hold as negotiations between Siemens and Areva descended into a legal battle over alleged breach of contract by Siemens.

In May a tribunal of the International Chamber of Commerce ruled that Siemens had not met its contractual obligations with regards to Areva NP, and ordered the German firm to pay Areva €648 million.

It also ruled that a non-compete clause in the two companies' contracts should remain in place until September 2013.

Siemens took the decision to exit the Areva NP partnership because it believed its 34 per cent share did not allow it to exert strategic influence over the company.

GE bullish on energy outlook

GE says it has transformed its business in the last decade and is in a good position for strong growth in the future.

Siân Crampsie

GE believes that market conditions are improving and has set ambitious targets for its energy business.

In a presentation to investors the US conglomerate said that its customers are "financially strong" and that the investments and acquisitions it has made over the last decade mean it is well positioned to "win in the up-cycles ahead".

John Krenicki, President and Chief Executive of GE Energy, said that over the coming decade, revenues from the energy sector would grow at a sustained 8-10 per cent per year. He said that key announcements made in the last few weeks – including the closure of a deal to buy Converteam and a multi-billion dollar deal covering gas turbines in Russia – illustrated the company's growing strengths.

The company has set a target of earning $60 billion in revenues from its energy division by 2014, a rise of 33 per cent from this year. The growth will come from renewables, conventional power systems as well as oil and gas, with emerging markets performing particularly well.

A longer-term target of reaching $100 billion in sales by 2020 has also been set.

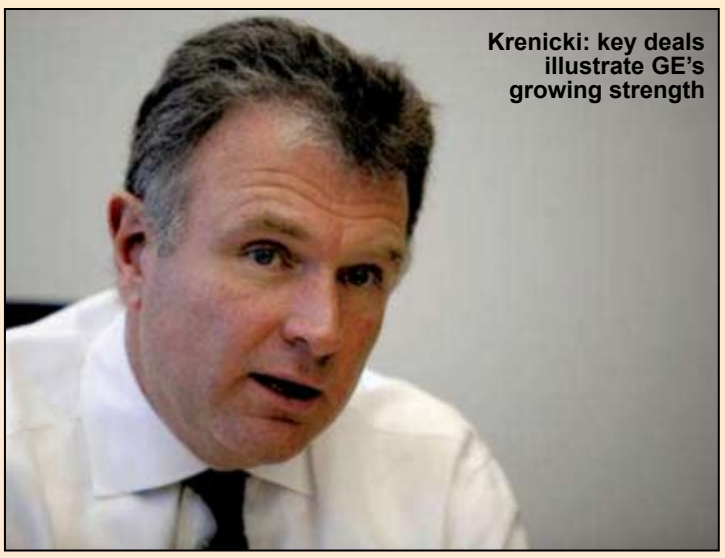
Overall, GE has spent in the region of $11 billion in the last decade on expanding its capabilities in the energy sector. It has retained its leading position in the gas turbine market but has also added key technologies such as wind and solar to its portfolio, said Krenicki.

"Improved product competitiveness and improved demand has positioned GE well for greater volumes [of product sales]," said Steve Bolze, President and CEO of GE Power & Water. He added that 2012 would see more shipments of gas turbines and continued growth in the renewables sector.

The company's distributed energy products are also experiencing double-digit growth.

In spite of growth in sales and revenues, GE is expecting margins to fall due to increased competition in markets such as wind and solar. Krenicki also said that the public policy environment could harm the renewables business in the coming years, but that GE was well placed to perform strongly because of its diverse range of products.

A decade ago nearly half of GE Energy's business came from its gas turbine sector in the USA, said Krenicki. That now stands at around nine per cent because of improved diversity and globalisation of the business.



Krenicki: key deals illustrate GE's growing strength

Vestas bets on Brazil

- V100 production starts in China
- Strong order book expected for Brazil

Brazil's energy demand is growing at 11 per cent per year

Vestas expects that recent investments it has made coupled with good performance in key growth markets will be a recipe for success.

The Danish wind turbine manufacturer wants to retain its leading position in the Brazilian wind market where up to 7 GW of capacity is expected to be installed to 2014, according to the Global Wind Energy Council.

Vestas' order book in Brazil currently stands at around 700 MW but the firm is expecting to book strong levels of orders for the country in the coming months. Worldwide, it has forecast orders in the range of 7-8 GW in 2011.

Brazil's energy demand is growing at around 11 per cent per year and its government wants to install 7 GW of wind in the next three years. Wind conditions in the country are good, says Vestas, although competition between wind turbine suppliers is fierce, leading to lower margins compared with other markets.

Vestas also recently reported the start of production of 49 m-long turbine blades for its new 2.6 MW V100 machine at a new factory in Tianjin, northern China.

The V100 is designed to meet increasing demand for wind turbines suitable for low-wind areas.

The first batch of blades will be shipped to South America, according to Vestas.

Shaw Group sells Westinghouse stake

- Deal will eliminate $1.7 billion of Shaw debt
- AP1000 projects unaffected

Westinghouse, Shaw Group and Toshiba say that they want to continue their working relationship in spite of Shaw Group's decision to sell its Westinghouse stake.

The US-based engineering firm has exercised an option to sell the 20 per cent stake that it owns in Westinghouse to Toshiba, Westinghouse's parent company. Toshiba will pay Shaw around $1.7 billion for the Westinghouse stake. Toshiba will own 87 per cent of Westinghouse after closure of the transaction. The remaining shares are held by IHI (three per cent) and Kazatomprom (ten per cent).

Shaw Group says that the decision will have no impact on any of the four Westinghouse AP1000 nuclear power plant projects that are under construction in China or on the six that are under contract in the USA. Shaw's decision to sell the stake is based purely on financial matters and is not a reflection of the current state of the nuclear industry, says the company.

"We firmly believe that exercising the put-options is in the best interest of our shareholders and our future business opportunities.

It will eliminate almost $1.7 billion of debt, further strengthening our balance sheet," said J.M. Bernhard Jr., Shaw's Chairman, President and Chief Executive Officer.

"Toshiba, Westinghouse and Shaw have worked together successfully both in the US and China, and we look forward to continuing to work together.

"We remain committed to our role as a premier constructor of nuclear power plants," he added.

The four plants in China currently under construction are scheduled to become operational beginning in 2013, with major nuclear components scheduled for installation this year. Extensive site preparation and pre-construction work is also well underway for two AP1000 units at each of the Southern Nuclear Operating Company's Vogtle site in Georgia and SCANA's Summer site located in South Carolina.

Westinghouse and Shaw Group are also under contract to provide two AP1000 units for Progress Energy in Levy County, Florida.

"Westinghouse continues to believe that the future of the nuclear energy industry is robust, and that a significant number of additional new construction projects around the world will be announced over the coming few years," commented Dr. Aris S. Candris, President and CEO of Westinghouse.

Tenders, Bids & Contracts

Americas

ABB wins Brazil order

ABB has won orders worth around $14 million from Galvão Energia SA to supply a new transformer substation and lay power cables to facilitate the transmission of electricity from a wind farm currently under construction in the Brazilian state of Rio Grande do Norte.

ABB will deliver a turnkey 34.5/138 kV substation as well as lay 60 km of 34.5 kV cables to connect four new wind power plants with a total capacity of 94 MW to the national grid. The substation will boost power supplies to consumers in northeastern Brazil.

The project is scheduled to enter commercial operation in September 2012.

Nicaragua orders wind turbines

Blue Power & Energy (BPE) has placed an order with Vestas for the supply of 22 wind turbines for the La Fe-San Martin in Nicaragua.

The order includes Vestas' V90-1.8MW wind turbine units, a Scada system and a five-year service and maintenance agreement. Vestas will supply and commission the turbines.

Goldwind to build US wind farm

China's Xinjiang Goldwind Science and Technology Co has announced plans to build a $200 million wind farm in Illinois, USA.

The 110 MW Shady Oaks wind farm will be located 160 km west of Chicago and will break ground this autumn. The project is a key part of Goldwind's plans to expand overseas.

Goldwind is China's second largest wind turbine manufacturer.

Iberdrola orders EMS

Iberdrola has placed an order with Siemens for the supply of an energy management system (EMS) that will merge two sites in New York state, USA, into a single system.

Siemens will install its Spectrum Power EMS at Rochester Gas & Electric and New York State Electric & Gas, replacing legacy platforms and addressing issues such as technical obsolescence. The two networks will be able to operate as a single network model, therefore improving operational efficiency.

GE enters Brazilian solar market

GE has signed a deal with MPX to double the output of an existing 1 MW solar photovoltaic (PV) power plant in Brazil.

The MPX-owned facility in Ceara state currently has 4680 solar panels and GE is to expand it with an additional 1 MW solar plant featuring its thin film PV panels.

The project signals GE's entry to the Brazilian solar power market.

Areva joins Bellefonte 1 team

Areva is to serve as a key member of the team of contract partners that are completing construction of the Bellefonte 1 nuclear power plant in Alabama, USA.

Areva's scope includes engineering, construction as well as component replacement work on the plant's nuclear systems as well as fuel design and fabrication. It will also supply a digital reactor instrumentation and control system, a completely modernised control room, and a plant simulator for training operations personnel.

When complete, the 1260 MW pressurised water reactor will be one of the USA's most modern nuclear plants and will produce enough electricity to supply about 750 000 households.

Asia-Pacific

Alstom Grid builds India substations

Alstom Grid-owned Areva T&D India Limited has been awarded a contract to construct two 765 kV extra high voltage substations in the Indian states of Maharashtra and Madhya Pradesh.

Under the €30 million contract, Alstom Grid will supply all 765 kV equipment for the two substations, which will make a significant addition to India's plans to expand its transmission network.

Ovation installation in Chinese USC plants

The China Power Investment Group has awarded US-based Emerson Process Management a contract to install its Ovation expert control system at two new ultra-supercritical coal fired generating units under construction at the Changshu power plant in Jiangsu Province, China.

The two new units, Unit 5 and Unit 6, are expected to begin operation in February 2012 and August 2012, respectively. They will support the economic development of the Yangtze Delta area.

At each new unit, the Ovation system will monitor and control the Shanghai boiler and balance-of-plant processes, as well as interface to the controls of the Shanghai turbine.

The Ovation systems for the two units will manage more than 30 800 I/O points. Emerson will supply a total of 18 workstations and 56 redundant controllers.

Alstom signs Lumut LTSA

Alstom has signed a 11-year long term service agreement (LTSA) worth approximately €150 million, with Teknik Janakuasa Sdn. Bhd. (TJSB), the wholly-owned O&M subsidiary of Malakoff Corporation Berhad, Malaysia's largest independent power producer (IPP).

The LTSA covers all nine GT13E2 gas turbines at the Lumut power plant and the scope includes the supply of new hot gas path components and provision of reconditioning services for all major inspections over the term of the contract.

The Lumut power plant is located in Segari in the state of Perak, west of the Peninsula Malaysia.

With a total generating capacity of 1943 MW, it is the largest GT13E2-based combined cycle power plant worldwide.

Europe

Westinghouse wins Beznau contract

Westinghouse Electric Company has been awarded a $35 million contract to install replacement reactor vessel (RV) heads at Units 1 and 2 of the Beznau nuclear power plant in Döttingen, Switzerland.

The two-unit, 730 MWe Beznau plant is equipped with Westinghouse pressurised water reactors.

Preliminary work is underway and the installation will take place during outages at the plant's 2014 spring (Unit 1) and autumn (Unit 2) outages.

Nordex receives Amaroni wind farm order

Italian generating company ERG Renew has placed an order with Nordex for nine wind turbines for the Amaroni wind farm in southern Italy.

The 22.5 MW Amaroni wind farm will feature Nordex's N90/2500 turbines, which Nordex will supply in May 2012. Nordex will service the units for at least ten years.

The Amaroni wind farm will be located in Catanzaro province adjacent to ERG Renew's Fossa del Lupo wind farm, which Nordex is currently commissioning.

Metso stronger in bioenergy

Metso has received orders for the supply of advanced automation systems for two new bioenergy power plants in Finland, strengthening its foothold in the country's bioenergy sector.

Porvoon Energia Oy has ordered a Metso DNA automation system including safety automation for its new biomass-fired power plant located in Tolkkinen, about 50 km northeast of Helsinki, while another Metso DNA system including safety automation, field design as well as information and reporting applications will be delivered to a bioenergy plant built by Hämeenkyrön Voima Oy in Hämeenkyrö, located about 220 km northwest of Helsinki.

Metso says it has also received an order from Helsinki Energy for a Metso DNA system to replace an existing automation system in its 118 MW Kellosaari reserve power plant.

Deal signed for 2 MW CPV plant

Limen and Titan Tracker have signed an agreement for the supply of dual-axis trackers for two 1 MW high concentrating photovoltaic (CPV) power plants in Sicily, Italy.

The two power plants will be the first of their kind in Italy. The agreement includes the supply of 80 trackers of a design characterised by minimal deformations, zero backlash and continuous movement in azimuth.

These features provide extremely high accuracy and reliability, two key issues for CPV plants.

Limen is currently developing a pipeline of utility-scale CPV projects in Italy.

Siemens wins solar field order

Siemens Energy has been awarded a contract by Ecolaire Espana to supply the solar field for a concentrating solar power (CSP) plant in Spain.

The 50 MW Arenales plant will have a parabolic trough design and will be built in Andalucía, Spain. The Siemens scope of supply encompasses the complete solar field, consisting of 156 loops, including the mirrors and the UVAC receiver.

The order is Siemens' second for an entire solar field.

International

Egypt selects GE technology

GE has signed contracts totalling $300 million to supply six gas turbines and associated services to the Egyptian Electricity Holding Company for two new combined cycle power plants near Cairo that will support Egypt's rapidly growing energy needs.

GE and its consortium partner, SEPCO III, have been selected for the expansions of Giza North and Banha power plants. The projects will add 2250 MW of capacity to the country's power grid.

Egypt experienced 13 per cent growth in electricity demand from 2009 to 2010, and the growth is expected to continue at a rate of approximately 11 per cent over the next five years. The Giza North and Banha plants are scheduled to enter service by the middle of 2013 in time to help the country meet its peak power demands during the summer.

GE will supply four Frame 9FA gas turbines for Giza North and two 9FA gas turbines for Banha, along with installation and technical services.

Eskom plans PV capacity

South African utility Eskom has asked ABB to build two pilot solar photovoltaic (PV) power plants in time for a major climate change conference scheduled to be held in Durban in late November 2011.

The two plants will be built on greenfield sites next to existing coal-fired power stations in Free State province and Mpumalanga province. They will be the first of their kind to be built in the country, says ABB.

One of the plants will fixed tilt facility with a capacity of 620 kW, and the other a single-axis tracking plant with a peaking capacity of 575 kW.

Ormat expands Kenya complex

The Overseas Private Investment Corporation (OPIC) is to provide Ormat International with project financing of $310 million to refinance and expand the 48 MW Olkaria III geothermal complex in Kenya.

Ormat is planning to expand the facility by up to 36 MW. The financing deal also includes an option to finance an additional 16 MW capacity expansion.

Financial close is scheduled for December 2011. The project financing comprises a refinancing tranche of up to $85 million, a construction loan tranche of up to $165 million and a $60 million standby facility for the optional 16 MW expansion.

GE seals Iraq LTSA

Mass Global Investment Company and GE have signed a multi-million dollar, multi-year agreement to ensure the long-term reliability of GE gas turbines installed at a number of power plants in northern Iraq.

The long term service agreement (LTSA) covers the supply of parts and repair services for 18 GE gas turbines installed at the Arbil, Sulaimaniyah and Dohuk power plants. Running for 12 years, the agreement covers planned outages at the plants, which feature GE Frame 9E units.

The key components of the contract also include inter-changeability of the latest parts technology for Mass Global's installed base, joint outage planning to provide the highest reliability, specially expedited parts delivery and customised field training programme for Mass Global's engineers.

Sasolburg power project contract awarded

Chemicals group, Sasol, has awarded Foster Wheeler an engineering, procurement and construction (EPC) contract for the expansion of a gas-fired power plant at its Sasolburg facility in South Africa.

Foster Wheeler is to expand the power plant by 140 MW, to enable Sasol to expand operations at the site. The project is expected to be completed in the second quarter of 2012.

UK wind is more than just a breeze

The UK is one of the world's most lucrative wind power markets, with plans to add around 25 GW of new wind capacity by 2020. However, reaching this target will have its challenges. **Junior Isles** speaks to RenewableUK's **Maria McCaffery** in the run up to the upcoming *RenewableUK 2011* conference in Manchester.

Maria McCaffery, RenewableUK's CEO, has seen a number of changes since coming into the wind power industry in 2006. What immediately springs to her mind is how wind power is now viewed within the electricity generation sector.

"There is the pronounced sense of wind being taken much more seriously. Five to ten years ago, it was aptly called 'alternative energy'. This term is hardly used at all now; it is seen as a mainstream contributor. Certainly, onshore wind is now a mature technology."

She notes, however, that when considering its natural resources, the UK has never really realised its full potential. "When you compare the UK to European neighbours such as Germany, Denmark and Spain, our level of deployment has seriously lagged behind."

The offshore story is quite different. Development has been rapid both in terms of technology and deployment. The last ten years have seen significant advances in the development of turbines specifically designed for the offshore environment. At the same time the UK leads the world in terms of deployment and scope for future development.

The identified opportunity has attracted huge amounts of inward investment into the UK, which McCaffery says puts the country on the "cusp of a manufacturing revolution".

According to RenewableUK, conservative estimates show that between now and 2020, the UK renewable energy sector can expect to create 88 000-90 000 new jobs, predominantly in wind.

"In 2008 we commissioned a study that was carried out by Baine & Co. At the time, there were about 6000 people employed in renewables in the UK. Cambridge Econometrics has just updated that study, which shows that the number has now almost doubled to 11 800," said McCaffery.

> Creating the right political framework is perhaps the single most important prerequisite for the UK to hit its wind energy targets

This is expected to increase even more rapidly through 2020 as the rate of deployment increases year-on-year. This will be significant to the UK economy. If economic development is measured by employment and private investment, renewable energy and wind energy in particular, will be sectors that will help lead the country out of recession.

While the UK's wind plan is a success story in the making, there are those who argue that the government's goals are unrealistic. Plans to grow installed capacity from the current 5.7 GW to 31 GW – 18 GW of which will be offshore – in just eight years appears to be a tall order.

McCaffery believes, however, that it is every bit achievable, although it will need the right political and economic framework. She says the shape and gradient of the deployment curve from 2015-2020 will be a function of how effectively the political, commercial and economic framework is put in place between now and 2014/15.

"It is most certainly doable. The onshore contribution is around 13-14 GW, so we are looking at roughly a three-fold increase. But if we add what is already in construction and what is consented and waiting to go forward to what's already operational, we're more than halfway towards that 13 GW. And if we get about two thirds of what is in the planning system consented and built, we will have achieved the target. Onshore wind has the benefit of having a well established supply chain so the target is eminently achievable in that timescale."

Achieving the offshore targets will not be quite as straightforward. There will be technical, economical and political challenges.

Offshore wind was in its early days regarded as a technology that could be transferred directly from land-based deployment. However, building and operating turbines out at sea presents a very different proposition to building on land.

As turbines are built out in deeper water, the technology surrounding turbine foundations has to be further developed and commercially deployed.

Carrying out maintenance on a turbine several kilometres offshore in water depths of 40-50 m is far more difficult. A great deal of design effort is therefore being put into reducing the need for maintenance by simplifying turbine designs.

Developing cable technology for transmitting power back to shore and laying the cables on the seabed without causing ecological disturbance has also been a major challenge. Indeed, the UK will have to revamp its 75-year old transmission grid to bring in offshore wind power under a regime, which as McCaffery puts it, "has some future-proofing".

"Parts of the grid are creaking at the seams, so whether we have renewables or not, we need a new grid. But if a significant part of our electricity is to come in from the sea, then the configuration of the grid is extremely important. The industry has lamented 'short-termism' for a long time where proposals that have been put forward have 5-7 year lifecycles. But generating assets are operational for 30-40 years, so you need a grid that has factored in the availability of generating assets for that sort of time. The offshore transmission regime is not completely resolved but the powers that be are becoming very focused on making sure we get that right."

In terms of commercial challenges, even small offshore wind farms carry high price tags. A major focus for the industry at present and looking forward to 2020-2030 will be how to drive down costs. McCaffery said: "All new technologies start off more expensive but with experience, technological developments and economies of scale, costs will come down. Global investors still have a healthy appetite for UK offshore projects."

Investment will also be needed for the new supply chain that is necessary to build the large turbines that will be deployed offshore. McCaffery acknowledges it will be a challenge but remains confident. "Factories capable of producing these large output turbines from day-one are not built yet but once they are, they will be producing at a great rate of knots. We've seen the worldwide giants of the power sector first making inward investment and now laying the foundations for R&D facilities and actual manufacturing plant in the UK."

McCaffery says investors still have a healthy appetite for UK offshore projects

Local manufacture will be an important step in driving down costs since it will eliminate exchange rate risks. Building local manufacturing plants will require hundreds of millions of pounds in investment but the ball has already started rolling on the back of government policy changes.

Indeed, according to McCaffery, creating the right political framework is perhaps the single most important prerequisite for the UK to hit its wind energy targets.

She said: "Commitments [for investment] tend to follow hard on the heels of announcements of big policy changes. For example, RenewableUK campaigned very hard for the new Coalition government to retain the outgoing Labour government's pledge to keep £60 million available for the development of ports infrastructure. Within 48 hours of the announcement at last October's Comprehensive Spending Review that this would be retained, big developers made public announcements on their commitments on where they will be building turbines."

The stability and attractiveness of the support mechanisms for renewables is pivotal to investor confidence. This is to be addressed through the UK's Electricity Market Reform (EMR).

The retirement of old nuclear plants and coal fired plant that cannot meet the Large Combustion Plant Directive will see the UK lose about a third of its generating capacity within this decade. The EMR is aimed at plugging the looming generation gap while decarbonising the country's electricity supply. The reform is perhaps the most radical change to the UK electricity market in decades and once it is in place it could be a significant length of time before any further changes are made.

McCaffery commented: "It is therefore important to get it right. Until we are able to completely decarbonise our electricity supply i.e. beyond 2050 out to 2080, we still need a contribution from fossil fuels. So the EMR cannot make it uneconomic to generate from traditional thermal plants either."

Some argue that the EMR is more focused on delivering renewables targets, wind in particular, as opposed to low carbon targets, and say that there are cheaper ways to decarbonise the electricity sector.

It is a point that McCaffery takes issue with. "To the best of our knowledge and belief, wind is our best bet. If someone knows of another low carbon technology that can come on stream in a shorter timescale, costs less, and is able to plug the same size generation gap, we'd really like to hear about it.

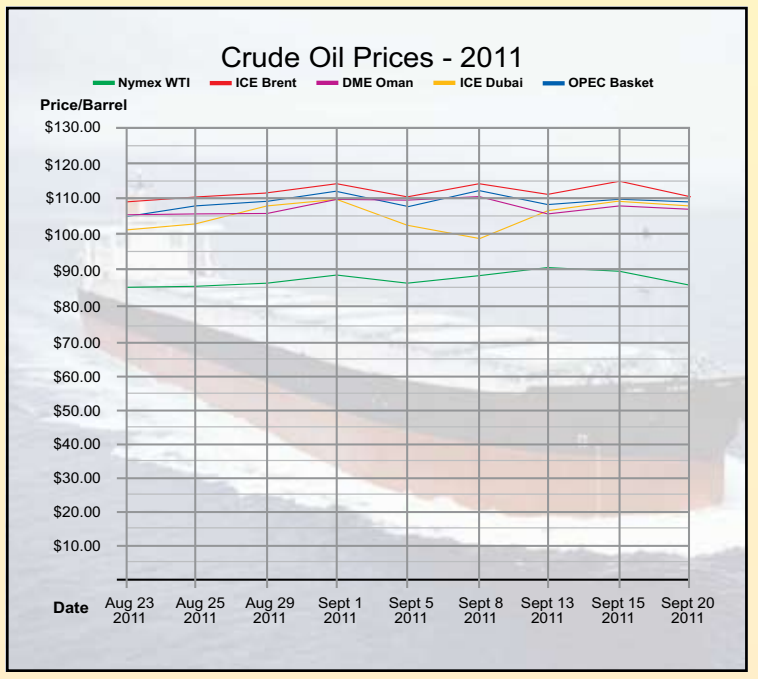
"The elephant in the room of course is nuclear, and in all probability, nuclear will restore its place but that will not happen in the next 10-15 years. And when it does, it will be extremely expensive. When nuclear was first introduced, the cost of decommissioning was going to be a government cost because we had a nationalised electricity sector. But now you have to factor in the cost of decommissioning, which is enormous. Nuclear may be able to generate at a very low cost per kWh but when you factor in decommissioning, it will not be that cheap."

RenewableUK also promotes wave and tidal technology and believes they have great potential to make a contribution, but not before the 2020 timeframe. McCafferey noted, however that it is an area that is not sufficiently supported in the UK Renewable Energy Roadmap, released alongside the EMR white paper, especially when considering the progress that has been made so far.

The EMR hite paper and Renewable Energy Roadmap are likely to be top of the agenda at the upcoming *RenewableUK 2011* conference in Manchester later this month. With the hope that the white paper will be turned into legislation by April next year, debate is likely to be heated.

Oil

Economic outlook weighs on crude oil market



- Gloomy scenario for oil demand
- Opec will cut production when "Libya comes back"

David Gregory

Crude oil prices moved lower into the $80/b range in late September as concerns for the global economy continued to mount.

Opec, the International Energy Agency (IEA) and the US Energy Information Administration (EIA) all forecast a decline in the demand for oil in their latest reports – the result of a faltering global economy.

"Uncertainties in the oil market are increasing at a time when the recovery of the global economy is losing momentum," Opec said in its September Monthly Oil Market Report. "Over recent months a deceleration of economic growth was observed in almost every major economy," it added. "The weaker economic recovery is negatively impacting oil demand," Opec declared. In its latest report, Opec revised world oil demand growth in 2011 down to 1.1 million b/d to average 87.99 million b/d. Demand for Opec crude during the year is expected to average 29.91 million b/d, it said.

"There are certainly growing concerns about the health of the global economy," the Paris-based IEA said in its Oil Market Report on September 13. "Government debt in the OECD and the spectre of inflationary pressures and currency protectionism in emerging markets raise fears that expectations of 'business-as usual' 4.5-5.0 world GDP growth are unsustainable," it said.

The IEA revised its forecast for global oil demand down by 200 000 b/d for 2011 and by 400 000 b/d for 2012. It predicted that world demand for crude would average 89.3 million b/d in 2011 and 90.7 million b/d in 2010. The call on Opec crude for 2011 would average 30.6 million b/d it forecast, adding that demand for Opec oil would remain at 30.6 million in 2012.

The EIA at the US Department of Energy echoed the gloomy scenario for the global economy and growth in oil demand. "With weaker economic growth and lower petroleum consumption growth, EIA expects the US average refiner acquisition cost of crude oil to rise from an average of $100/b in 2011 to $103/b in 2012," the EIA said.

High prices for gasoline in the US have played a role in the argument about why the economy cannot get moving – that being that with consumers having to pay more for gasoline, there is less disposable income left for anything else. The EIA said gasoline retail prices in July and August averaged between $3.58 and $3.71 per gallon, and it projected a decline in price to $3.47 per gallon for the fourth quarter of the year.

With the conflict in Libya now over, more crude from the North African state is expected to gradually make its way back onto the world market, but this is unlikely to result in a situation that could reduce crude prices. Opec Secretary General Abdullah al-Badri told a conference in Dubai on September 19 that as Libyan crude comes back on the market, other Opec producers will cut their own output.

"I can assure you that when Libya comes back, our member countries will reduce their production. I have no doubt," Badri told conference delegates, according to *Platts*.

Opec production has surged in recent months in the wake of the civil war in Libya, which removed 1.3-1.5 million b/d from the market. During July Opec members produced an average of 29.87 million b/d.

According to the London-based Centre for Global Energy Studies (CGES), more crude supply from Opec is vital to allow a global economic recovery that would in turn boost crude oil demand.

It said in its September *Monthly Oil Report* that with the economic slowdown spreading across the world, it could be expected to see crude oil prices falling, but it said the reason prices remain high is due to a shortage of supply. This is despite the near 1 million b/d increase in Saudi Arabian production and the release by the IEA of up to 60 million barrels of crude and products from strategic stocks. "Oil prices are likely to remain high unless, or until, the supply shortage eases," the CGES said.

"While oil market fundamentals remain tight, oil prices will not fall, no matter how dire the global economic outlook," it stated. "Without more supply, only another demand collapse will bring prices down."

Gas

Southern gas corridor gets boost from EC

Europe's decision to negotiate a treaty for the construction of a pipeline across the Caspian Sea is a significant move in its attempt to reduce dependence on Russian gas.

Mark Goetz

The Southern Corridor, a concept that may bring new sources of gas supply to Europe, gained momentum last month when the European Union decided to mandate the European Commission with the task of negotiating a "legally binding treaty" between the EU, Azerbaijan and Turkmenistan for the construction of a pipeline across the Caspian Sea.

This is the first time that the EU has proposed a treaty in support of an infrastructure project. "The treaty will be concluded by the EU after decision by all 27 member states that the European Commission should lead the negotiations on behalf of them all," the EC said in a statement on September 12. "Europe is now speaking with one voice," Energy Commissioner Gunther Oettinger said. "The Trans-Caspian Pipeline is a major project in the Southern Corridor to bring new sources of gas to Europe. We have the intention to achieve this as soon as possible."

The Trans-Caspian Gas Pipeline (TCGP) – first proposed in the 1990s – would connect Turkmenistan with Azerbaijan, from where Turkmen gas would flow to European markets through a pipeline system travelling across Azerbaijan, Georgia and Turkey.

The Southern Corridor system would comprise several proposed pipeline projects. The EU and US have expressed their support for the Nabucco gas pipeline project, which proposes to carry 31 billion cubic m^3 per year (bcm/y) of gas from the Caspian and Middle East to Europe, but which has yet to secure sources of supply. Nabucco is competing with the Interconnector-Turkey-Greece-Italy (ITGI) and Trans Adriatic Pipeline projects for the 10 bcm/y that will come on-stream from Azerbaijan's Shah Deniz gas field in 2017, but that gas is only enough to address the capacity of one pipeline.

Shortly after the EC made the announcement, Russia and Iran expressed their opposition to the idea. Both countries are littoral Caspian Sea states and have their own designs on the European gas market.

Russia last month finalised an agreement with European partners to construct the South Stream gas pipeline, a plan to build a 900 km pipeline with a capacity of 63 bcm/y across the Black Sea to Europe.

The EU, which is keen to reduce its dependence on Russia for gas supplies, sees South Stream largely as a political project designed to bypass Ukraine, which has been problematic about Russian gas shipments in the past, and at the same time, overwhelm the Nabucco project.

Because of its capacity, the success of Nabucco is to some degree dependent upon gas supplies from Turkmenistan, which has on numerous occasions expressed its desire to diversify its exports by shipping gas to Europe, but which is also reluctant to use the Russian pipeline system to do so following past disagreements.

Azerbaijan and Turkmenistan have been at odds over their Caspian maritime border and the hydrocarbon resources that lie beneath them since their independence from the Soviet Union, but the EU decision suggests that Brussels believes the time may be right to arrange an understanding between the two and move ahead with the TCGP.

A decision by Azerbaijan on which Southern Corridor pipeline project will win the contracts for Shah Deniz gas is to be made by the end of the year. EC action now towards the materialisation of a TCGP strengthens Nabucco's position, but with enough volume, could enable all three projects to survive.

Turkmenistan would play no role in the construction of the TCGP but Ashgabat gave a sign of approval to the EU decision later in September when it awarded a contract to Ukraine to supply it with pipes that would be used for the construction of its East-West Pipeline.

Gas produced in Turkmenistan's offshore Block 1 could be made available to fill the initial 10 bcm/y capacity of the TCGP, but the country has made it known that it would be ready to sell 30-40 bcm/y to Europe.

The EC statement said that discussions with Azerbaijan and Turkmenistan will focus on a treaty setting out legal commitments between the EU and the two countries as well as the bilateral arrangements necessary for the two countries to achieve the commissioning, building and operation for the TCGP, plus the legal framework that will apply to filling the pipeline with gas from Turkmenistan, including an appropriate recognition of commercial arrangements.

Striking a balance

Within the next two years, the EPA is expected to take action on a number of air, water and waste issues that could have a large impact on the future of US coal fired plants. But the industry is committed to working with the EPA to ensure that future coal use will be accompanied by even greater improvements in environmental quality.
Quin Shea

Over the past 40 years, US electric utilities have made great progress in reducing emissions from power plants. The industry has reduced sulphur dioxide (SO_2) and nitrogen oxides (NO_x) emissions by 70 per cent each over the past 20 years and new regulations will continue the progress. Utilities are committed to providing customers with affordable, reliable power that is increasingly clean.

As the industry continues to modernise its generation fleet and transmission systems, utilities are building on the progress that has already been made by using technologies that are more efficient and will reduce emissions even further.

Edison Electric Institute (EEI), along with its member electric companies and other stakeholders, is working with the US Environmental Protection Agency (EPA) on the development of rules that would further regulate emissions from coal fired power plants. EEI wants to ensure that these new regulations not only protect the environment, but also give the industry a reasonable amount of time and flexibility to comply with them.

Effectively crafted regulations coupled with advanced electric generating technologies is the best way to further emissions reductions, while allowing electric utilities to meet their mandate to supply customers with a reliable, affordable electricity supply.

Within the next two years, the EPA is expected to take action on a number of air, water and waste issues that, taken together, have the potential to have a particularly large impact on both existing fleet of coal fired generating units and utilities' decisions on whether to build new plants. These rules include:

- The Cross-State Air Pollution Rule (CSAPR) governing power plant SO_2 and NO_x emissions (finalised in August 2011).
- The Utility MACT ("maximum achievable control technology") rule to control utility emissions of mercury and other hazardous air pollutants (expected to be finalised in November 2011).
- A new rule governing cooling water intake structures at existing power plants.
- A proposed rule governing the disposal of coal ash and other coal combustion residuals.

These rules are among the agency's most ambitious undertakings to date. Each will require retrofit, retirement, or replacement of a substantial portion of existing US coal fleet, all by around 2015. Already, in response to the Utility MACT and the other rules, power companies have announced that they will retire almost 50 GW of coal-based generation (about 14.0 per cent of the country's total coal-based capacity in 2010) or switch the plants to using other fuels.

Without proper coordination of EPA regulatory initiatives among groups like the Federal Energy Regulatory Commission or the North American Electric Reliability Corporation, there is a real danger that the implementation of these various rules will raise costs and lead to local or regional reliability challenges.

For example, requiring control technology retrofits in too short a period could strain the ability of materials producers and equipment suppliers to deliver the equipment, leading to higher costs for labour and materials. These premiums could in turn lead to higher electricity costs for consumers. Furthermore, aggressive, inflexible implementation schedules may also lead to outright shortages of materials and labour, which would make it impossible for utilities to comply by the regulatory deadlines.

Generating units that cannot meet deadlines would need to be taken offline until any needed retrofits could be completed. This could lead to localised reliability issues for the overall electric generation system, if those units cause minimum electricity reserve margins to drop and alternative supply options are not available.

The lead-time for building new generating units and transmission lines, however, is extensive due to the difficulty in obtaining required pre-construction environmental permits. Even permits for advanced technology projects are subjected to challenges that can lead to lengthy and costly construction delays. There is also a possibility that the permits needed to install all the new and retrofit control technologies cannot be issued by state regulators in a timely fashion, thus jeopardising a utility's ability to comply with the new requirements.

While US utilities are committed to a clean energy future with coal, given these realities there is the need for time and flexibility in complying with the proposed regulations.

Today, base load coal plants (typically 500 MW and above) generate more than 43 per cent of the country's electricity. Base load coal plants also serve to ensure continued reliability of electric transmission systems across the country.

Shea: EEI wants to ensure that the new EPA regulations not only protect the environment but also give the industry a reasonable amount of time and flexibility to comply with them

> "These rules are among the agency's most ambitious undertakings to date. Generating units that cannot meet deadlines would need to be taken offline… This could lead to reliability issues for electric generation system"

These units are an important component of maintaining adequate reserve margins, and thus have a dual function of providing power and ensuring the reliability and stability of regional transmission grids. To meet expected future electricity demand, which the federal government projects will increase by 31 per cent by 2035, the power sector will continue to rely on US coal reserves and its base load coal plants to ensure that the country continues to enjoy a stable supply of affordable and reliable electricity.

However, the substantial energy and economic advantages that coal fired generation provides must be balanced by environmental compliance and environmental excellence. To protect human health and the environment, electric companies are spending billions of dollars each year on environmental practices, technology, and operational measures. Importantly, air quality has improved dramatically during the past 30 years as a result of these investments.

Nationally, US utilities have lowered both power plant SO_2 and NO_x emissions by about 70 per cent since 1990. The eastern states have cut ozone-related summer NO_x emissions by 80 per cent during the same period. The new proposed EPA regulations will lead to SO_2, NO_x, mercury and other emissions being reduced 80-90 per cent in most eastern states compared to 1990. What is truly remarkable, however, is that while these emissions reductions were taking place, electricity demand was actually increasing.

The power industry is committed to ensuring that future coal use will be accompanied by even greater improvements in environmental quality.

Advanced generating technology under development will be a critical factor in further reducing the emissions from coal plants.

Advanced coal technologies include circulating fluidised bed technology (CFB), which can reduce SO_2 and NO_x emissions by 90 per cent; supercritical (SC) and ultra supercritical (USC) pulverised coal plants, which operate at increasingly higher temperatures and pressures and therefore achieve higher efficiencies than conventional coal plants; and, integrated gasification combined cycle (IGCC). All of these advanced coal technologies are currently under construction by some EEI member companies.

A CFB employs a method of burning coal (and/or other solid fuels), which is fluidised by an upward flow of air, on a bed of either inert material (usually sand) or sorbent material (usually limestone) at low temperatures. This design allows the coal to achieve a higher percentage of combustion and negates the need for external SO_2 emissions controls.

SC and USC plants operate at higher temperatures and pressures than traditional pulverised coal plants. The resulting higher efficiency means that emissions of criteria pollutants and CO_2 emissions are reduced. Currently, there are over 20 operating USC power plants in the world.

IGCC offers a unique process to convert coal into electricity, hydrogen, and other valuable energy products. IGCC plants convert coal (or other carbon-based materials) into a synthetic gas.

The syngas is then cleaned to remove impurities, such as sulphur, and the gas is then used to fuel a combined cycle plant. Currently, there are two operating IGCC power plants in the United States (Florida and Indiana).

In September 2011, the U.S. Department of Energy (DOE) awarded a total of $14 million to six projects aimed at developing technologies that decrease the cost of producing electricity from IGCC power plants that have carbon capture technology installed.

The power industry has begun exploring methods for capturing and storing CO_2 as well. A 25 MW carbon capture and storage (CCS) demonstration at Southern Company's Plant Barry power station, near Mobile, Alabama, began operation in June 2011.

It will capture about 150 000 tons of CO_2 annually for permanent underground storage in a deep saline geologic formation.

DOE also has launched a new National Carbon Capture Center (NCCC) to speed up the development and testing of new technologies to capture carbon from coal-based power plants. The NCCC will focus national efforts on reducing greenhouse gas emissions through technological innovation, and serve as a test centre for emerging carbon capture technologies.

EEI and its members share a strong commitment to protecting the environment. It is dedicated to working with the EPA to develop reasonable and flexible rules and will continue to advance cleaner, more efficient coal technologies.

The EEI will work together with the EPA to reduce the industry's impact on the environment even further, while ensuring that customers have the reliable, affordable electricity supply they demand.

Quin Shea is Vice President of Environment at Edison Electric Institute. EEI is the association of US shareholder-owned electric companies, which represent about 70 per cent of the US electric power industry.

Unveiling an offshore giant

In June this year, Siemens began trial operation of the first prototype of its 6 MW wind turbine, specifically aimed at the offshore market. **Junior Isles** was among the first to see the new machine at the test site in Denmark.

Since 1991, Vindeby, the world's first commercial offshore wind power project has been feeding electricity into the Danish grid. The wind farm has an installed capacity of almost 5 MW, produced from 11 turbines each with a rated output of 450 kW.

The industry and technology has come a long way since then. Twenty years ago Siemens needed 11 machines to produce 5 MW; today it is testing a prototype offshore turbine, which on its own, is capable of producing more than the entire output of Vindeby.

Although Siemens is not the only company introducing a large offshore wind turbine, it is the first to begin testing of the new wave of large offshore machines that manufacturers are hoping to have ready for Round 3 of the UK's offshore wind programme.

The UK programme is planned to have a total capacity of 32 GW across nine zones – meeting a quarter of the UK's demand and making it the world's largest offshore wind development programme.

In preparation for UK R3, in June this year Siemens began testing its SWT 6.0 wind turbine in Høvsøre in Denmark. With an output of 6 MW, the turbine represents one of several machines launched by various manufacturers in the 6-7 MW range that are scheduled to be ready for commercial release around 2013/14 in time for the start of development of the UK R3 programme.

This first prototype, designated the STW-6.0-120 is a direct drive turbine with a rotor diameter of 121 m. The blade design of this first prototype is the same as the proven B58 blade now used on the SWT-3.6-120. They are made of fibreglass in one piece, with no glue. Siemens has opted for proven blade technology in this first series in order to reduce customer risk. Later, a version with a blade length of more than 150 m will be introduced.

The nacelle being lifted to the top of the tower

Commenting on the technology, Henrik Stiesdal, Chief Technology Officer in Siemens' wind turbine division said: "It all begins with the blades. The aerodynamics has the most direct influence on energy output."

At 13 r/min, the 121 m rotor of the prototype has a tip speed of 80 m/s. At present the blades have the normal straight tip, but Siemens is considering the application of a winglet design similar that used in aircrafts to shape the tip vortex. In an aircraft, the tip vortex losses, caused by an under-pressure above the wing and an over-pressure below the wing, can be reduced with a winglet. This typically results in five per cent less fuel use for an aircraft that has winglets. Stiesdal says, however, it is not so easy in a wind turbine. "The under-pressure side is where the classical aircraft winglet goes but this is towards the tower and could potentially hit the tower under loading. So, we developed a winglet that goes the other way around."

He added: "We have some other fancy flow devices on the blade. One of the most useful flow devices is something we call vortex generators that pump new air into the boundary layer on the blade. There is also the possibility of a slot placed on top of the blade to shape airflow over the blade."

The turbine also uses direct drive technology, with the aim of producing a simplified turbine design that is competitive on performance, has lower tower head mass, very high availability and is cheap to maintain compared to a geared machine.

It is the third direct drive wind turbine type developed by Siemens. In the direct drive concept, the generator takes torque directly from the rotor. Siemens began serious development of its direct drive concept in 1999, but the project first really took off in 2005. This resulted in the production of its first two direct drive machines in 2008. These first 3.6 MW machine was installed in Denmark in July of that year.

Direct drive technology is already being used in Siemens' smaller 3.0 MW and 2.3 MW machines now in serial production. Manufactured at Siemens' factory in Brande, Denmark, the turbines are built as three simple modules: the rotor hub and blades, the generator, and balance of equipment.

The turbines use a radial flux, low voltage, air-cooled generator with permanent magnets made from rare earth elements, iron and boron. Permanent magnet excitation means there are no losses and high efficiency is achieved at low loads. Unlike conventional generators where the rotor is inside the stator, Siemens turns this inside out so the stator windings are placed inside the rotor with the permanent magnets facing inwards.

The overall arrangement achieves a compact design. The 3.0 MW direct drive generator has an outside diameter of 4.2 m compared to 5 m for the classical design. The reduced size means the nacelle has lower weight and notably it is just under the maximum size that can be transported throughout Europe by road. The generator has a closed design, which Siemens believes is the most suited for offshore application.

The main aim of developing a direct drive machine is the reduction of costs since there is a direct relationship between turbine weight and costs. Siemens says the design results in a tower head mass of 45 t/MW compared to 55 t/MW for its geared turbine.

The nacelle of the 6 MW machine weighs 200 t. This lighter weight nacelle is a significant factor out at sea, since it means less extensive foundations are needed.

According to Siemens, a direct drive turbine has 50 per cent fewer components than a geared turbine. Siemens believes this will not only result in the need for less maintenance but also creates a nacelle that has plenty of room inside to perform maintenance. There is a fixed hollow shaft inside the generator that provides direct access to the hub. There is good space around the electrical cabinets and it is possible to walk directly into the hub and gain access to the roof. Notably, this is the first Siemens machine with a helicopter hoisting platform to allow easy access for service technicians.

The nacelle, which is turned by 12 yaw motors, features a new bed-plate design for supporting the generator and other main components. The transformer is also placed up in the nacelle so that the complete nacelle can be tested and assembled onshore. This could significantly reduce potential commissioning costs, since the cost of working on equipment offshore is, according to Siemens, typically 10 times higher than in the factory.

The nacelle for the first 6.0 MW 121 m rotor prototype left the factory on May 13, 2011 and was lifted into position on May 20th before beginning operation in June.

Following testing of the prototype, Siemens plans to install at least 30 pilot, or pre-series, units over the coming years, some at onshore locations in Denmark, Germany the Netherlands and the United Kingdom, others offshore. However, all are being built as offshore turbines.

At the same time, it is also developing a longer rotor version, which will be introduced in 2012. While the rotor diameter has not been disclosed, Siemens says it will be larger than 150 m. However, it notes that it will use the same nacelle as the 121 m-rotor model and so, to some extent, will be based on proven technology.

Due to its size, the turbine will be built at a harbour location. Siemens is looking at facilities in the UK but says the manufacturing site will ultimately depend on local labour conditions, available facilities and government support.

This large-rotor variant is expected to become the workhorse of the expansion of offshore wind power in Europe.

The nacelle and rotor of the SWT-6.0-120 together weigh less than 350 tons

Junior Isles

Peddling the blues

He appeared undeterred – despite being the solitary protester outside this year's World Nuclear Association (WNA) symposium in London. "Profiteers of peril! No nuclear, no nuclear, nooooo!" Even with recent events at Fukushima, such protests were likely to fall on deaf ears here, and probably in most circles within the power industry.

The need to cut carbon emissions is still high on most governments' agendas. Yet the road towards a low carbon economy will be bumpy. Post Fukushima, nuclear has a less certain future. Meanwhile, renewables – the route Germany is planning following its decision to abandon nuclear – is also facing its own challenges.

The UN nuclear agency recently said it now expects nuclear power to grow more slowly than before the Fukushima disaster. Last month, Hans Holger Rogner of the International Atomic Energy Agency said that the number of nuclear reactors in use by 2030 will increase by anywhere from 90 to 350 from the present 432. The agency's high projection foresees nuclear power accounting for 13.5 per cent of total energy generation in 2050. Its low projection forecasts a nuclear share of 6.2 per cent. This compares with projections last year of 17 per cent and 7.1 per cent in 2050.

While acknowledging that nuclear will be in for a rough ride, speakers at the WNA conference remained upbeat.

Christopher Crane, WNA Chairman and President and Chief Operating Officer of US utility, Exelon said: "Fukushima has caused policy uncertainties but there are growth opportunities [in the US] through licence renewals. Nuclear is still seen as a low cost, low carbon option."

Indeed this seems to be the premise for a continued nuclear future. Just before the conference opening, the OECD Nuclear Energy Agency (NEA) issued a report titled: *'Carbon Pricing, power markets and the competitiveness of nuclear power'*.

Speaking at the launch of the report Dr Ron Cameron, Head of the Nuclear Development Division at the NEA noted that the three key drivers for nuclear are climate change, security of supply and economics.

"Nuclear power emits no CO_2 during operation; it acts as a quasi-indigenous source of electricity since fuel is purchased on uranium markets; and it has attractive economics when you look at the longer term view. When you've got over the initial stage, you have a good handle on your costs from then on."

> "Nuclear power's high overnight costs raises special issues for financing – a characteristic it shares with other low carbon technologies such as renewables"

The study, which was started in September last year is, according to the NEA, the first-ever attempt to tackle the question of competitiveness of different power generation technologies under carbon pricing on the basis of empirical data. It analyses daily data from European power and carbon markets from July 2005 to May 2010 – almost the first five years of the European Emissions Trading System (ETS).

One of the basic conclusions of the study is that competition in electricity markets is today being played out between nuclear and gas fired generation, with coal fired power generation not being competitive once carbon pricing is introduced. "Whether nuclear energy or natural gas comes out ahead depends on a number of assumptions, which can yield very different outcomes," says the report.

The results apply primarily to OECD Europe. Its calculations show that nuclear is the most competitive in terms of levelised cost of electricity (LCOE) for a carbon price above about €15/t CO_2. In Asia, where the cost of gas is much higher, nuclear power becomes cheapest at about €5/t CO_2. In North America, where gas price is currently very low, LCOE for nuclear is lower than coal and gas fired generation at above €17/t CO_2.

While nuclear may be the cheapest form of generation in terms of cost per MWh, even the NEA will concede that its high overnight costs raises special issues for financing – a characteristic that it shares with other low carbon technologies such as renewables.

Although renewables will be one of the main beneficiaries of the disaster at Fukushima, financing remains a key issue for the sector, especially when considering the decreasing risk appetite of investors.

According to the report: *'Regulatory And Political Headwinds May Slow Renewable Energy Growth'* recently released by Standard & Poor's (S&P) Ratings Services, the "somewhat bleak" fiscal forecast for the US and Europe presents a major challenge for the renewable energy sector.

"The vast majority of investors have been European banks and European banks we know are in trouble," said S&P senior director Swami Venkataraman. "If sovereign defaults happen, they wipe out the capital of European banks. They will pull back on all lending and renewables are going to get hurt badly."

It was a sentiment partly echoed by Liam O'Keefe, Managing Director and head of project finance at Credit Agricole at the Renewable Energy Finance Forum (REFF) in London last month. While he said there was still a lot of liquidity in the market, he noted: "There seemed to be fear as US dollar deposits were pulled from European banks. There's a split market at the moment: Eurozone and non-Eurozone banks. The problem for renewables is that the main source of funding is from European banks."

Financing will prove to be a particular challenge in the UK, which has the world's most ambitious programme for offshore wind development. Speaking at the REFF, Bruce Duguid, a Senior Advisor at the UK's Green Investment Bank said: "The UK is leading the way in developing policies to achieve ambitious green targets but financing issues will continue to limit the scale and pace of the transition."

In analysing projections for growth in the wider European renewable energy landscape, Tom Howes, deputy head of Unit for Renewable Energy at the European Commission said: "Our progress report earlier this year found that there has been a bit of a surge. There's not much interest in the earlier targets for 2010, which are not going to be met but there's a bit more enthusiasm and credibility for the 2020 targets."

Meanwhile, according to a recent report from Netherlands-based Rabobank International, renewable energy asset financing rebounded in the second quarter of 2011 to almost $14 billion from below $5 billion in the first quarter. The average deal value increased to $212 million compared to $64 million over the previous six quarters, partly reflecting an increase in the number of utility-scale offshore wind transactions, the report found.

Although the current debt crisis in the Eurozone is posing problems, it's not all doom and gloom – at least when considering the long term.

Renewable energy projects have so far failed to attract the large pension funds, important to providing the large amount of financing that is needed in a short timeframe. But experts believe this could change once project developers establish a longer track record with more project history. Some also argue that the long term nature of power projects offer an asset liability match for pension funds.

Certainly the large European utilities are confident that renewables will continue to experience a rapid growth rate, even with the financial challenges. According to data presented at the REFF by Dr Cord Landsmann, Chief Financial Officer, E.On Climate and Renewables, generating capacity from renewables in the EU-27 is set to almost double from 250 GW in 2010 to 482 GW in 2020.

These numbers show that the industry believes the debt crisis will be resolved before long and the financing for renewables will come. Indeed in the long run, financing is likely to be less of a problem than stable long term policy. This is probably also the case for nuclear.

If governments maintain their commitment to low carbon energy, even in tough economic times, the current outlook for renewables will improve.

Even the cloud over nuclear will clear, and the lone protester will go home.