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THE ENERGY INDUSTRY TIMES

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Richard Jones: world "coming ever closer to missing targets"

World Bank may increase clean energy financing

A possible revision of World Bank strategy to increase financing for clean energy projects coincides with an International Energy Agency report that says successes in deployment of clean energy technologies are being overshadowed by continued hunger for fossil fuels.

Junior Isles

The World Bank is considering donating a larger portion of financing to clean energy projects, while imposing further restrictions on lending for coal fired projects.

A draft strategy document addressed to the bank's committee on development effectiveness is being discussed internally before it is released for public consultation, with the intention of adopting it later this year.

According to the document, energy projects would receive 75 per cent of the World Bank's lending to the energy sector by 2015, compared to 67 per cent in the three years 2008-10.

The bank also says it will stop financing coal projects, except in the least developed countries – those eligible for support by the International Development Association (IDA) fund for the poorest countries. In those cases, the World Bank could support coal development if it meets criteria for poverty-relief benefits and lack of alternatives.

It would also support brownfield coal projects that increase the efficiency of existing power stations, as well as natural gas and oil projects in some circumstances.

The report says the bank plans to undertake by 2012 an analysis of the greenhouse gas emissions of every power generation project financed, with carbon foot-printing introduced for all other energy sector projects "in two years".

Discussion of the World Bank strategy coincides with a new report from the International Energy Agency (IEA), which says that successes in deployment of clean energy technologies are being overshadowed by continued hunger for fossil fuels.

It is the IEA's first Clean Energy Progress Report, which assesses global deployment of clean energy technologies and provides recommendations to countries on future action and spending.

Presented at the second Clean Energy Ministerial Meeting in Abu Dhabi by ambassador Richard Jones, Deputy Executive Director of the IEA, the report says that surging demand for fossil fuels is outstripping deployment of clean energy technologies.

Coal has met 47 per cent of the global new electricity demand over the past decade, eclipsing clean energy efforts made over the same period, which include improved implementation of energy efficiency and rapid growth in the use of renewable energy sources.

In order to change this status quo, the IEA argues that more aggressive

Continued on page 2

Fukushima complicates moves to clean energy

Climate change negotiators and activists are calling for nations to go all-out to tap wind, solar and other clean, renewable energy in the wake of the nuclear crisis at the Fukushima Daiichi plant in Japan.

Responding to comments that scrapping nuclear plants will result in a swing back to fossil fuels and therefore increase greenhouse gas emissions, environmental activists say that the tragedy may prove to be a defining moment – a window of opportunity to strike a decisive blow against both nuclear and climate change.

"It's a false choice to give the public an alternative between a climate change disaster or a nuclear disaster. We need renewable energy," said Tove Maria Ryding of the environmental group Greenpeace. "Now, we can either have a kick back or a leap forward."

The impact of the nuclear crisis was top of the agenda at a 173-nation conference in Bangkok last month. Christiana Figueres, the U.N.'s top climate change official, said that all countries are reviewing nuclear policies in the wake of Japan's crisis. "It remains to be seen what they decide," she said.

Figueres and others are concerned that pledges made by governments to reduce greenhouse gas emissions so far equal only 60 per cent of what scientists say is required by 2020 to keep temperatures from rising more than 2ºC above pre-industrial levels.

The International Energy Agency's (IEA) chief economist Fatih Birol said: "The doors are fast closing on the 2°C target, and with a decrease in nuclear energy it makes it even more difficult. It's all bad news – cost of energy will increase, energy security and diversification decrease and carbon emissions will go up."

Before a tsunami hit the Fukushima Daiichi nuclear complex in March, the IEA had estimated that 360 GW of nuclear generating capacity would be added globally by 2035. After the accident, that projection has been cut in half.

Birol commented that some world leaders may have been "too abrupt" in moving away from nuclear energy in the wake of the Japanese disaster. "When we have all the input from Fukushima, I am sure that policy makers will take another look, especially given the big economic stakes," he said.

The gap left by nuclear is likely to be filled equally by renewable energy, coal and gas. The result will mean an additional 5 per cent, or 500 million tons, of carbon dioxide emitted globally by 2035, Birol said.

Ryding said she is concerned that several governments, already backtracking on earlier pledges to reduce emissions, may use Fukushima as an argument to do even less.

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(Continued from page 1)

clean energy policies are required, including the removal of fossil fuel subsidies and the implementation of transparent, predictable and adaptive incentives for cleaner energy options.

According to the IEA, the world's dependence on fossil fuels is posing short-term risks to political stability and economic activity and is threatening environmental sustainability.

"Despite countries' best efforts, the world is coming ever closer to missing targets that we believe are essential for meeting the goal agreed in Cancun to limit the growth in global average temperatures to less than 2ºC," said Jones.

He added: "A number of countries have shown that achieving rapid transition to cleaner technologies is possible, and can be done from the bottom up. We must see more ambitious, effective policies that respond to market signals while providing long-term, predictable support."

The Clean Energy Progress Report provides an overview of key policy developments, public spending on research, development, demonstration and deployment of clean energy technologies – including renewable energy, energy efficiency, electric vehicles, nuclear power, biofuels and CO_2 capture and storage (CCS) – and their global deployment status.

The report notes that policy support over the last decade has led to a positive rise in renewable energy, especially in solar and wind power.

"In the case of solar energy, at least ten countries now have sizeable domestic markets, up from just three in 2000. Wind power also experienced dramatic growth over the last decade; global installed capacity at the end of 2010 was around 194 GW, more than ten times the 17 GW that was in place at the end of the year in 2000," the report observes.

Despite this progress, however, it states that worldwide renewable electricity generation since 1990 grew an average of 2.7 per cent per year, which is less than the 3 per cent growth seen for total electricity generation.

Consequently, "achieving the goal of halving global energy-related CO_2 emissions by 2050 will require a doubling of all renewable generation use by 2020 from today's level".

In order to reduce emissions from fossil fuels, particularly coal, the report stresses the importance of raising the efficiency of existing and new coal-fired plants.

"Switching to less carbon-intensive fuels (e.g. from coal to natural gas) and improving the efficiency of coal plants will achieve significant reductions in CO_2 and should be a top priority," the report stated.

In order to achieve a 50 per cent reduction in energy-related CO_2 emissions by 2050, the IEA says around 100 large-scale carbon capture and storage (CCS) projects will be needed by 2020, and over 3000 by 2050.

Fukushima shutdown will take months

The timetable outlining plans to bring the Fukushima Daiichi plant under control indicates a long road with a number of technical challenges. **Junior Isles**


Yukio Edano: "...expected high radioactivity..."

Resolving the crisis at the crippled Fukushima Daiichi nuclear power plant could take as long as nine months according to the first timetable released by Tokyo Electric Power Company (Tepco).

The timetable's first step, to be completed within three months, focuses on creating a stable water circulation system to cool the three overheated reactors and four spent fuel pools, reducing radiation leaks and decontaminating water that has become radioactive.

The next step, to be achieved within six to nine months, is to bring the release of radioactive materials fully under control and achieve a "cold shutdown" of the reactors. Achieving a cold shutdown means reducing the temperature inside every reactor below 100ºC at atmospheric pressure – meaning the radioactive fuel would not heat up again.

The task presents a challenge for engineers. Cooling the fuel rods requires large amounts of water, but damage caused by the hydrogen explosions means the more water that is pumped in, the more it leaks down as contaminated water into the service tunnels and other areas where it might escape into the sea.

One solution being considered is to flood the reactors' containment chambers with enough water to immerse the pressure vessels that contain the fuel. Tepco has been following the standard procedure of pumping water directly into the pressure vessels to cool the reactors but adding coolant to the normally dry area around them could reduce their temperature faster.

Before this can be done, engineers must seal leaks and keep combustible hydrogen out by pumping in inert nitrogen.

As part of this second step the reactor buildings must be covered to keep in radioactive air, first with a form of industrial cloth, and later with concrete walls and roofs.

Once cold shutdown has been achieved, decommissioning can begin, a process that is expected to take a decade.

Readings from robots that entered Units 1 and 3 for the first time in mid-April revealed a harsh environment still too radioactive for workers to enter.

Officials said the radiation findings should not hamper the goal of achieving a cold shutdown of the plant according to the timetable.

"We have expected high radioactivity inside the reactor buildings, which was confirmed by data collected by the robot," said Chief Cabinet Secretary Yukio Edano. "Even I had expected high radioactivity in those areas. I'm sure Tepco and other experts have factored in those figures when they compiled the roadmap."

The robots investigated Unit 2 on April 18th. Tepco official Takeshi Makigami said the robots would pave the way for workers to be able to re-enter the building.

"What robots can do is limited, so eventually, people must enter the buildings," Makigami said.

Readings from a water tank in Unit 2 showed a severe spike in radiation that indicates likely damage to the fuel rods inside the spent fuel pool there, Tepco officials said. That was the first indication of damage to those rods.

The radiation was far higher than that measured in the spent fuel pool of Unit 4, suggesting the damage to the fuel in Unit 2 is greater.

On April 15th the Atomic Energy Society of Japan said the fuel rods in reactors 1, 2 and 3 had been severely damaged and that pieces of the rods had melted into fragments about 1 cm wide or smaller and drifted to the bottom of the pressure vessels. These could theoretically burn through the pressure vessels, causing a massive radiation release to the environment if emergency water-pumping operations are seriously disrupted.

As the levels of radiation detected in seawater near the plant rise, the evacuation radius around the plant has been increased from 20 km to 30 km.

Tepco, which has been criticised for its initial handling of the crisis, announced plans to give 1 million yen ($12,000) in initial compensation to each evacuated household, with much more expected later.

The government vowed to overhaul nuclear safety standards once the reactor complex is under control, admitting that its safeguards were insufficient to protect the plant against the March 11 tsunami.

Calls for international nuclear safety standards


Robots controlled by Xbox 360 pads assist relief efforts at the plant

World leaders are calling for international safety standards following the nuclear crisis at Japan's Fukushima Daiichi nuclear power plant.

In Tokyo at the end of March, visiting French President Nicolas Sarkozy called for the Group of 20 nations to meet and discuss international nuclear safety standards in the wake of the crisis.

Sarkozy, the first foreign leader to visit Japan following the disaster, was in Tokyo for talks with Prime Minister Naoto Kan. Sarkozy offered support in helping to stabilise the plants, and the two agreed to cooperate in drawing up the standards by the end of this year. They also said this year's meeting of the Group of Eight industrial nations would discuss the accidents at the plant.


Sarkozy: the first foreign leader to visit Japan following the disaster

The French president said the summit meeting would release a communique on the issue.

European Union leaders also called for worldwide stress testing of nuclear plants and committed to putting their 143 reactors through the toughest security checks possible.

At the end of a two-day summit in late March, the EU nations agreed to submit their nuclear plants to tough safety tests by year-end. France, the most reliant on nuclear energy with 58 reactors, said it would immediately close any plant if it failed a test.

German Chancellor Angela Merkel said the 27 leaders agreed "on uniform euro stress tests and the highest possible safety standards".

She said: "The experience of Japan has to be reflected in the new stress tests. This is not business as usual."

Speaking after the summit, Merkel said the European stress tests would be prepared in a coordinated fashion.

The EU says it will also press for other European nations to follow suit.

"Because the danger does not stop at our borders, we encourage and support neighbouring countries to do similar stress-tests," said EU President Herman Van Rompuy.

"A worldwide review of nuclear plants would be best."

In early April at the first global-level nuclear safety meeting since the Japanese nuclear crisis, participating countries pledged to act on lessons of the Fukushima accident.

Representatives from dozens of countries (Contracting Parties to the Convention on Nuclear Safety) met at the headquarters of the International Atomic Energy Agency (IAEA) to scrutinise safety at each other's power plants with the aim of avoiding accidents such as that at Fukushima.

"The international community recognises the significance of the Fukushima nuclear accident, which highlights the need to consider new challenges and underlines the paramount importance of safety in the use of nuclear energy," said a statement representing the Contracting Parties issued at the closing of the meeting.

It goes on to say that the lessons learned process could not be completed until sufficient additional information is known and fully analysed, and Japan has committed to provide the information as soon as possible.

There are 72 Contracting Parties to the Convention, and all countries with operating nuclear power plants are now Parties to the Convention.

Obama plans for oil import cuts


President Obama: determined to boost clean energy

- Plans outlined for secure energy future
- CA leads renewable energy standard tables

Siân Crampsie

US President Barack Obama has shown his determination to implement his clean energy policies with the publication of a comprehensive national energy policy.

At the heart of the document is a plan to cut oil imports to the US by one third in just over a decade and boost the development of clean energy technologies. Its key objective is to ensure that energy supplies in the US are secure, diverse and affordable.

According to the US government, US crude production reached its highest level in 2010 since 2003 while imports have started to decrease – for the first time in a decade, imports last year accounted for less than half of what was consumed in the country.

It wants this trend to continue by encouraging "safe and responsible" oil exploration and production, promoting energy efficiency and funding cutting-edge research into advanced and clean energy technologies.

Obama has been repeatedly frustrated by failed attempts to pass clean energy legislation at the federal level while disasters such as the Deepwater Horizon oil spill and the Fukushima crisis have further complicated the energy landscape.

Clean energy and carbon trading legislation is now being championed by a handful of US states, while Obama hopes that policies that support technology innovation in the energy and transport fields will enable him to achieve the goals he set out when he took office.

Last month California became the leader among US states in the clean energy race, implementing legislation requiring Californian utilities to get one-third of their power from renewable resources.

Obama wants 80 per cent of the USA's electricity needs to be sourced from clean energy resources – including nuclear energy – by 2035 and to put 1 million electric vehicles on the roads by 2015.

Current policies aimed at reaching these goals include investing in technology innovation with Recovery Act funds, boosting clean energy production through production tax credits and siting major renewable energy projects on public lands. The government is also continuing its support of clean coal and nuclear energy technologies, and is committed to promoting offshore wind development on the Atlantic coast, says Obama's administration.

Moving forward, Obama wants to implement a clean energy standard (CES) that would provide power generating companies with tradeable credits for clean energy production. The credits would cover renewable energy as well as nuclear power, efficient CCGTs and coal plants that capture and store carbon.

The enhanced domestic oil production, the government has pledged to look into ways to encourage the development of leased resources as it estimates that around 57 per cent of onshore leased acres remain unexplored or undeveloped. Such incentives could include shorter lease terms to include rapid development and rewarding rapid development with lease extensions.

Domestic gas production can be enhanced through the continued exploration of the country's vast shale gas reserves, although the document stresses that this must be done with "appropriate safeguards to protect public health".

To boost energy efficiency, Obama has pledged public funds to implement a variety of energy efficiency programmes targeting the domestic, commercial and industrial sectors. US homes, businesses and factories account for more than 70 per cent of energy consumption and reducing demand will help to improve competitiveness, reduce electricity bills and protect the environment, says Obama.

In California, proponents of the new renewable energy standard say that the policy will attract federal subsidies and loan guarantees for renewable projects, stabilise prices for ratepayers, and create over 100 000 green jobs, especially in rural areas that have been hard hit by the economic recession and where land for wind and solar projects is plentiful.

The new 33 per cent standard is an increase on the state's current standard of 20 per cent and must be achieved by the end of 2020.

Last month the US Department of Energy announced that it had offered loan guarantees to support the California Valley Solar Ranch, Ivanpah and the Blythe solar power projects in California. All three projects are key developments in the state's renewable energy programme and will also help to reduce the costs of both photovoltaic (PV) and concentrating solar power (CSP) technologies.

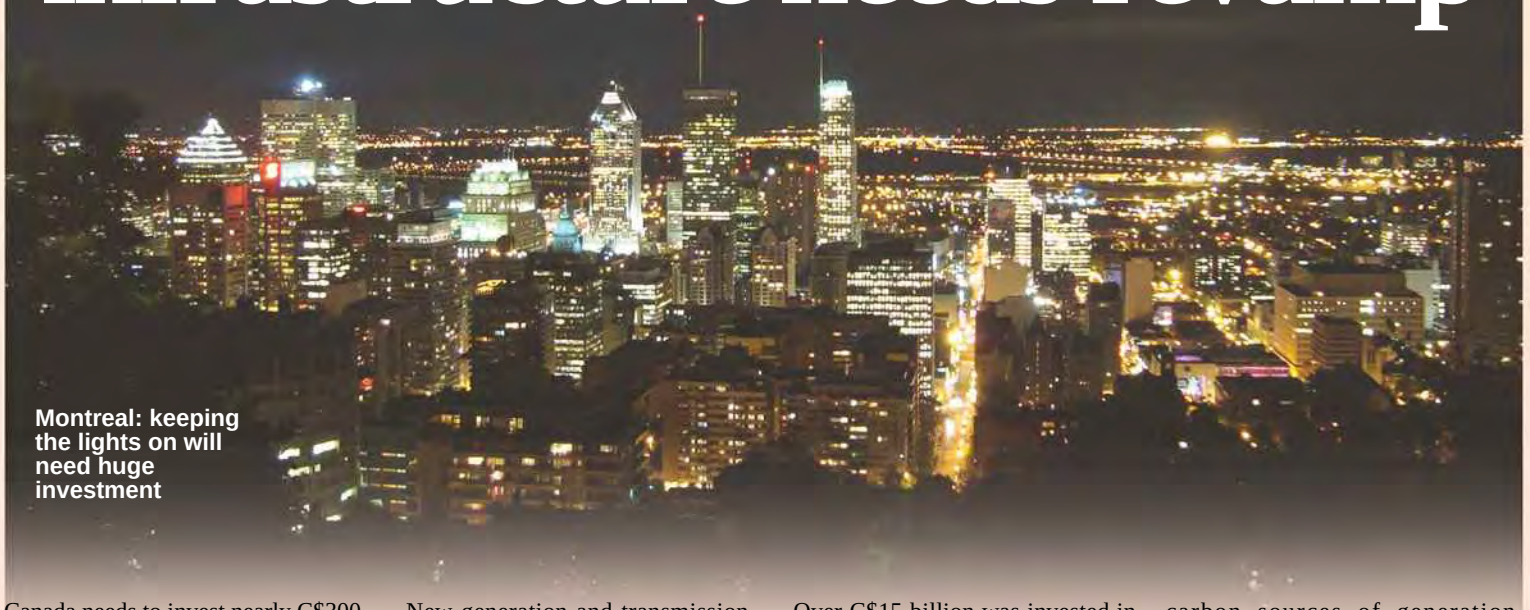
BrightSource Energy – the developer of the Ivanpah CSP project – also recently secured $75 million in funding from Alstom and $168 million of funds from internet giant Google.

Critics of the legislation said sticking with traditional energy sources such as coal and natural gas would be cheaper, keeping costs down for business and residential ratepayers. Business groups point to estimates that the higher standard could drive up electricity costs for California ratepayers by more than seven per cent, despite language in the legislation to limit cost increases.

The California Republican Party pointed to one study that suggested the average Californian's energy bill would go up 19 per cent under the new standard.

Last year Colorado implemented a 30 per cent renewable energy standard. Other US states, including New Mexico, Nevada, Montana, Oregon and Maryland have implemented renewable energy standards of between 15 and 25 per cent.

Ageing Canadian infrastructure needs revamp


Montreal: keeping the lights on will need huge investment

Canada needs to invest nearly C$300 billion over the next 20 years in order to keep the lights on, according to a report from a Canadian think-tank.

The Conference Board of Canada (CBC) has carried out a detailed analysis of the current state of Canada's electricity infrastructure and its future needs, and believes that investments of more than C$15 billion per year are needed between 2010 and 2030 to meet growing electricity demand.

New generation and transmission capacity is needed as well as upgrades to existing infrastructure, according to CBC. Some hydropower facilities in the country date back to the early 1900s, says the organisation.

The investment will come from a mixture of private and public funds, as electricity infrastructure in some Canadian provinces is government-owned while in others it is privately owned.

Over C$15 billion was invested in the country's electricity sector in both 2009 and 2010.

According to CBC, more than half of Canada's current infrastructure was built before 1980 and was based on a population of about 20 million. Today that system is servicing the needs of about 35 million.

Around C$196 billion of the investment would go into generation, with most into renewable or low-carbon sources of generation, according to CBC. A further C$62 billion will be needed in the distribution system, both to upgrade existing facilities and put new systems in place.

The electricity sector contributed about C$24.6 billion to the Canadian economy in 2010 – 2 per cent of gross domestic product. Canada exports 7-9 per cent of its electrical generation and is a net electricity exporter.

Forest fires cut Venezuelan supplies

Continuing power cuts and electricity shortages in Venezuela have highlighted the need for major investment in the country's power infrastructure.

Last month saw the temporary implementation of electricity rationing after the country experienced its worst blackout in two years.

The major power failure hit the capital Caracas on April 8th and spread across 11 states in the northern half of the country. Both oil production and transport systems were affected as some 10 000 MW of generating capacity was cut off from the grid.

The problem was caused by a forest fire that damaged overhead transmission lines in Carabobo state, according to state utility Corpoelec.

Installed capacity in Venezuela is 24 000 MW.

Last year the government enforced a widespread electricity rationing programme after low water levels at the Guri hydropower plant reservoir led to frequent blackouts. The country's economy is now emerging from recession and increased electricity demand is placing a strain on the grid.

In 2010 the Venezuelan government invested $5.5 billion in the electricity sector, and added around 1700 MW of generating capacity to the grid. A further 2500 MW will be added this year.

China and Korea focus on renewables amid nuclear safety concerns

- S. Korea to boost renewable research
- China nuclear freeze could last until 2012

South Korea and China plan to increase their targets for power generation from renewables following the nuclear crisis at the Fukushima Daiichi nuclear power plant in Japan.

South Korea says it plans to spend 1.04 trillion won ($947 million) this year on renewable energy research and nuclear safety projects.

The Ministry of Knowledge Economy said the money would be used to promote alternative energy developments to safeguard against higher oil prices and strengthen nuclear safety, to which policymakers have paid close attention after the disaster at Fukushima.

Meanwhile, China may double its target for solar power capacity to 10 GW in 2015 from the 5 GW originally planned, the *China Securities Journal* reported. China is expected to announce a new five-year target for the solar industry soon.

Last month the countries agreed to strengthen cooperation in nuclear safety in the wake of the Fukushima crisis. According to South Korea's *Yonhap News Agency*, Chinese Premier Wen Jiabao and South Korean Prime Minister Kim Hwang Sik reached the agreement in a meeting in Beijing, a day after Japan raised the severity of the accident at the Fukushima Daiichi power plant to level 7 from 5.

Yonhap said Wen told Kim that a trilateral summit involving South Korea, China and Japan, which is set to open in Tokyo this month [May], may become a forum for the three nations to jointly discuss nuclear safety.

In April, Chinese officials indicated that the freeze on new nuclear projects could last until the beginning of 2012, while the country drafts new safety codes and a new Atomic Energy Law. According to Feng Yi, deputy secretary-general of the China Nuclear Energy Association, the drafting of the new Law will be finished by October, and the new safety regulations will be completed by the end of this year.

The slowdown would affect nine nuclear projects awaiting approval this year, said Mr Feng.

According to the China Electricity Council, recent policy changes are likely to result in a reduction of about 10 GW in nuclear generating capacity from the 90 GW previously expected to be built by 2020.

Government plans called for nuclear to supply up to 5 per cent of China's power by 2020 but this was now likely to be closer to 3 per cent due to the policy changes.

Wen Jiabao: Chinese Premier

Kim Hwang Sik: South Korean Prime Minister

Indonesia geothermal to benefit from JBIC financing

Financing of coal and geothermal projects will help Indonesia's new effort to put nuclear on the back burner in the wake of Fukushima, says **Syed Ali.**

The Japan Bank of International Cooperation (JBIC) says it is ready to finance the development of two power plants in Central Java and North Sumatra with a total value of more than $1 billion.

The bank's executive director, Fumio Hoshi, said that negotiations on funding the two projects had reached the final stage and he expected the tender process to be completed in the near future.

"At the moment there is a tender for Central Java's supercritical coal-fired power plant project, [the winner is expected to be announced this month], he said at the Indonesia International Infrastructure Conference and Exhibition 2011. "We're also working on the Salula geothermal power plant in North Sumatra."

Besides the two power plants, Hoshi said the JBIC might also finance other geothermal power plant projects in Sumatra. Two Japanese companies identified at least four potential geothermal fields on the island, he added.

The Indonesian government plans to prioritise the use of new and renewable energy, especially geothermal, hydro and bio fuels, over nuclear. Luluk Sumiarso, the director general of renewable energy at the Energy Ministry said the government would consider using nuclear energy as the last option.

Speaking to the *Jakarta Globe* newspaper, he explained: "But it does not mean that nuclear is not being prepared. The ministry will continue to prepare it, but we are now maximising the use of new and renewable energy, such as geothermal, hydro-energy and bio fuels, which have the potential for development."

He said the government was revising its proportion of new and renewable energy utilisation from the previous target of 17 per cent to 25 per cent by 2025. Geothermal capacity is planned to increase to 2000 MW in 2012 and reach 5000 MW in 2014. The country's geothermal potential is around 29 000 MW.

At the end of March, Dahlan Iskan, Head of Indonesia's state-run electricity company, PLN, said geothermal, hydro and other renewables, as well as coal and gas, were cheaper options than nuclear. "Commercially, Indonesia does not need nuclear power plants yet," he said. He noted, however, that it would be good to begin preparations for the possibility of using nuclear energy.

Australia to outline detailed timeline for carbon tax

Australia has moved to present a more detailed timeline for implementing a carbon tax.

Climate Change Minister Greg Combet last month announced that Treasury modelling would be complete by the middle of this year and said that a Productivity Commission examination of the impact of carbon prices on the economies of Australia's trading partners is expected in late May.

"For the carbon price to take effect from July 1 next year, as minister, I am aiming to finalise the detailed design in time to introduce the legislation into the parliament in the third quarter of this year," Combet told the National Press Club in Canberra.

The carbon tax revenue is expected to total at least A$12 billion in 2012/13 but is being met by increasing opposition. A recent poll of 1400 people showed that 59 per cent of voters are against the plan, with major food retailers, miners, energy and agriculture firms writing letters to the prime minister opposing the tax.

A letter by the Business Council said a carbon policy without adequate compensation for Australian industries could force production to move offshore to countries with less rigorous climate policies.

In a move to reassure business, Combet said the government was committed to providing substantial transitional assistance to emissions-intensive, trade-exposed industries.

Combet said after compensation, a carbon price of US$20.9 per tonne would add $2.7 to the cost of a tonne of steel, which sells for around $835 and would add $19.5 to a tonne of aluminium, which sells for around $2612.

"In other words, the carbon cost relating to the core pollution activity for steel would be one-third of one per cent of the value of a tonne of steel and three-quarters of one per cent of the value of a tonne of aluminium," he said.

Prime Minister Julia Gillard guaranteed the federal government would use more than 50 per cent of the revenue raised from the carbon tax to assist households with cost of living rises.

Nuclear assessors make recommendations on Indian nukes

A group of Indian nuclear assessors have made a number of recommendations aimed at increasing safety at all of its nuclear power plants to prevent a crisis in the event of a natural disaster similar to that which damaged Japan's Fukushima Daiichi nuclear power plant.

The recommendations by assessors from Nuclear Power Corporation of India, who inspected India's 20 nuclear power plants, include: augmenting water supplies for cooling; making the primary containment inert with nitrogen; installing new technologies to ensure automatic shutdowns in case of a major earthquake and providing an alert mechanism for tsunamis.

"Additional shore protection measures are also being undertaken, which will absorb considerable energy from tsunami waves," said Shreyans K. Jain, chairman of Nuclear Power Corporation of India in a statement. At least six units at two power stations would be at tsunami risk.

While the Fukushima disaster has many in India questioning the wisdom of building new plants, the government is going ahead with its nuclear expansion programme. Last month, it ruled out any rethink on the proposed 9900 MW nuclear power plant at Jaitapur in Maharashtra state.

Environment and Forests Minister Jairam Ramesh said in Mumbai: "It stays. There is no rethink. What happened in Fukushima is a wakeup call for all of us. We need nuclear power. India cannot abandon nuclear power. We have 3 per cent of our electricity coming from nuclear sources. Now we have to increase it to 6 per cent by 2020 and roughly 14 per cent by 2030."

Germany falters over nuclear future

Japan's Fukushima disaster has stoked the flames of the nuclear energy debate in both Germany and Italy, **writes Siân Crampsie.**

The crisis at Japan's Fukushima Daiichi nuclear power plant has thrown Germany's energy policy into turmoil.

While the German government is working furiously on the development of a new and comprehensive energy road map, imports of electricity from neighbouring countries have risen and the country's four big utilities have started counting the cost of the temporary shutdown of the country's oldest nuclear plants.

Energy policy has also faltered in Italy, where Silvio Berlusconi's centre-right government announced a one-year moratorium on its nuclear new build programme.

One of the German utilities – RWE – announced last month that it would sue the government for damages if Germany's courts ruled that the government's decision to take nuclear power units offline for a three-month period was without legal merit.

RWE has lodged an appeal with the German courts against the forced closure of its Biblis A unit and said in a statement that "since German nuclear power plants comply with all relevant safety requirements, there are no legal grounds for decommissioning them".

German Chancellor Angela Merkel ordered the closure of seven nuclear units just days after the March 11 earthquake and tsunami in Japan. RWE has not revealed the cost of the closures, but analysts believe it will cost the firm in the region of €100 million because it will have to buy power on the spot market to fulfill its contractual obligations.

EnBW has said that it is not planning to take legal action, while E.On and Vattenfall have yet to make a decision. Industry groups in Germany have pointed out that the closure of the nuclear plants has made Germany a net importer and that imports from nuclear-reliant France have doubled since mid-March.

The four utilities have also stopped making payments into a renewable energy fund, which was created earlier this year as a condition of allowing them to extend the operating lives of their nuclear power plants.

The proceeds of the fund – amounting to around €300 million per year – were to be used to support the development of renewable energy, energy efficiency and energy storage.

Merkel has convened an ethical review board to discuss the future of nuclear energy. It has until late May to discuss the risks associated with nuclear energy and the drawbacks of switching from nuclear to alternative energy sources such as coal or renewables.

Merkel has made it clear that closing Germany's nuclear power plants must result in a rise in carbon emissions. However, implementing a faster switch from nuclear power to renewables than was previously planned will be costly.

Angela Merkel has German utilities up-in-arms

Market analysts Datamonitor have highlighted Germany's limited interconnection capacity with neighbouring countries as well as the difficulties that the country's own grid has absorbing high levels of renewable energy generation. "The energy industry and government bodies need to look beyond the question of nuclear power to include power network upgrades," said Datamonitor in a research note.

As in Germany, anti-nuclear sentiment has grown in Italy and forced the government to table a bill reversing the legislation that set out plans for the construction of new nuclear power plants. It is unclear whether the legislation will spell the end – again – for nuclear power in Italy but it is bound to disappoint energy groups EDF and Enel, which had joined forces to invest in the construction of new capacity in the country.

France-based EDF, meanwhile, has been ordered by regulator Autorité de Sureté Nucléaire (ASN) to improve the maintenance of its nuclear reactor fleet. ASN is carrying out a comprehensive safety review of nuclear power plants in France and has also hinted that it could suspend the construction of new nuclear capacity in the country.

- Bulgaria and Russia say they will postpone the construction of the Belene nuclear plant for three months while they analyse plant safety in the wake of the Fukushima nuclear disaster.

France sets tariff for EDF rivals

EDF's competitors in France have expressed disappointment at the government's decision to set the price at which EDF must sell them some of its nuclear energy output at a level they think is not competitive.

Under a new law established to ensure that France complies with EU rules on the opening of electricity markets to competition, EDF will be required to sell one-quarter of its output from its nuclear power plants to competitors at a rate set by the government.

EDF rivals such as GDF Suez and Poweo had lobbied for the tariff to be lower than €35/MWh while EDF wanted to see the new tariff – known as ARENH – to be at least €42/MWh to cover the cost of production, maintenance and investment.

The government announced last month that the tariff would stand at €40/MWh from July 1, 2011, and rise to €42/MWh in January 2012.

GDF Suez said that the tariff rate would mean that the French government would fall short of its commitments to the European Commission on market opening. It said in a statement that it would "study the consequences of this decision and the possible avenues to remedy the narrow opening of the market in the short-term caused by the government's decisions."

The French government says that it had to consider EDF's ability to meet new nuclear safety standards in the wake of the disaster in Japan. An independent report commissioned by the government last year had recommended a price of €38-40/MWh.

Exchange launches safe harbour for permits

A new initiative from leading environmental trading exchange company BlueNext aims to restore confidence in Europe's carbon markets and eliminate fraud and theft involving carbon emission allowances.

The Paris-based firm has announced plans to launch its 'Safe Zone' trading market, on which only carbon permits whose chain of title can be traced back to their original source can be traded.

The move is in response to the recent rise in the number of thefts via hacking of EU carbon allowances (EUAs) – some 4 million have been stolen in the last 18 months – and a corresponding drop in confidence in the entire EU carbon market.

Part of the problem lies in the fact that traders have unwittingly bought stolen EUAs.

"Recent events in the carbon market have rocked its foundations to the point where it would not be an exaggeration to say the very future of the carbon market is at stake," said BlueNext CEO François-Xavier Saint-Macary. "As a result, we have had no choice but to construct a new system – one in which our members can be assured of the integrity of the units being traded on the exchange.

"Trust and confidence in the physical carbon markets can now be restored."

BlueNext – which accounted for around 60 per cent of the exchange-traded market for spot EUAs in 2010 – says that its initiative has the support of its members. It will require its members to give it read-only access to their operating accounts in order to enable it to check the provenance of allowances.

"The current infrastructure, supervision and governance deficiencies have placed an unsustainable level of risk on market participants," said Jérôme Malka, managing director of Orbeo, a carbon trading joint venture of bank Société Générale and chemicals firm Rhodia. "We believe the BlueNext initiative will restore confidence, increase liquidity and provide an appropriate benchmark price for the market."

Interconnections are no silver bullet

The introduction of improved transmission interconnections will only partially alleviate the volatility associated with increased renewable energy generation in Europe, a new study has found.

Energy consultant Pöyry says that while the creation of an offshore supergrid and major upgrades of energy interconnections are required, they are not the 'silver bullet' solution to Europe's energy needs.

In a detailed analysis of the future impacts that wind and solar energy will have on electricity markets across northern Europe, Pöyry says that the increased use of renewable energy generation will create peaks and troughs of electricity production that are likely to conflict with customer demand. For example, when supply is at its lowest on a calm and cold day, demand may be greatest.

Weather systems can also extend across thousands of kilometres, rendering interconnections redundant.

The study suggests that one of the most effective ways of mitigating the challenges of renewable energy generation is through demand side management and energy storage solutions.

Policy certainty attracts renewable energy investment

Countries with the strongest and most supportive clean energy policies are most successful at attracting investment, according to a new report.

Siân Crampsie

The clean energy sector is emerging as one of the most dynamic and competitive areas of the world economy, although low natural gas prices in North America appear to be affecting investment levels.

New research by the Pew Charitable Trusts shows that globally, clean energy investment grew to $243 billion in 2010, up 30 per cent on 2009, with China, Germany, Italy and India being most successful at attracting finance to their renewable energy sectors.

However, a recent report from Bloomberg New Energy Finance (BNEF) indicates that subsidy cuts in Europe and low natural gas prices in the USA have caused renewable energy investment in the first quarter of 2011 to drop to the lowest level since 2009.

Pew's research – undertaken in partnership with BNEF – examines how the G20 nations are faring when attracting private investment to their clean energy sectors.

Investments in the G20 countries accounted for more than 90 per cent of the global total in 2010, says Pew, with China maintaining top spot with a record $54.4 billion in investment – a 39 per cent increase over 2009.

Germany lies in second place, up from third place last year, after experiencing a 100 per cent increase in investment to $41.2 billion. Overall, the global clean energy sector has grown by 630 per cent since 2004, says Pew.

"Countries like China, Germany and India were attractive to financers because they have national policies that support renewable energy standards, carbon reduction targets and/or incentives for investment and production and that create long-term certainty for investors," said Phyllis Cuttino, director of Pew's Clean Energy Program.

The report also suggests that uncertainty surrounding clean energy policies in some countries is causing investors to look elsewhere for opportunities. The USA fell from second to third place in the league table in 2010 with $34 billion of investment, while the UK dropped from fifth to 13th place.

Phyllis Cuttino: director of Pew's Clean Energy Program

In Europe, subsidy cuts have already had an impact on the solar sector, according to BNEF's analysis of the first three months of 2011. Large falls in investment have also been seen in the USA's wind energy sector.

According to BNEF, money flowing into the renewable energy industry worldwide through asset finance, share sales, venture capital and private equity fell more than a third to $31.1 billion in the first three months of the year from a record $47.1 billion in the fourth quarter of 2010.

The Chinese and Brazilian wind energy sectors were two of the brightest areas in the first quarter of the year, said BNEF.

"Whether 2011 turns into another record year for clean energy investment will depend in part on whether the improving cost-competitiveness of renewable power, particularly solar photovoltaics, can outweigh policy uncertainties that continue to dog several important developed economy markets," said Michael Liebreich, chief executive of BNEF.

According to Pew's research, the wind energy sector globally remains the most attractive for investors, although the solar sector experienced a 53 per cent increase in investments in 2010 to $79 billion. Germany – which is planning to cut subsidies for solar energy – accounted for 45 per cent of global solar investments in 2010.

China now has nearly 43.5 GW of installed wind energy capacity and 800 MW of solar. Brazil attracted $7.6 billion of investment in 2010, one-third of which went to the wind energy sector, while India joined the top-ten for the first time with $4 billion of investment.

Iran resumes fuel reloading

- Bushehr back on track
- Iran ready to install enrichment centrifuges

Russian nuclear energy technology firm Atomstroyexport says that it is preparing to start reassembling the reactor of Iran's Bushehr nuclear power plant after the fuel had to be removed due to contamination concerns.

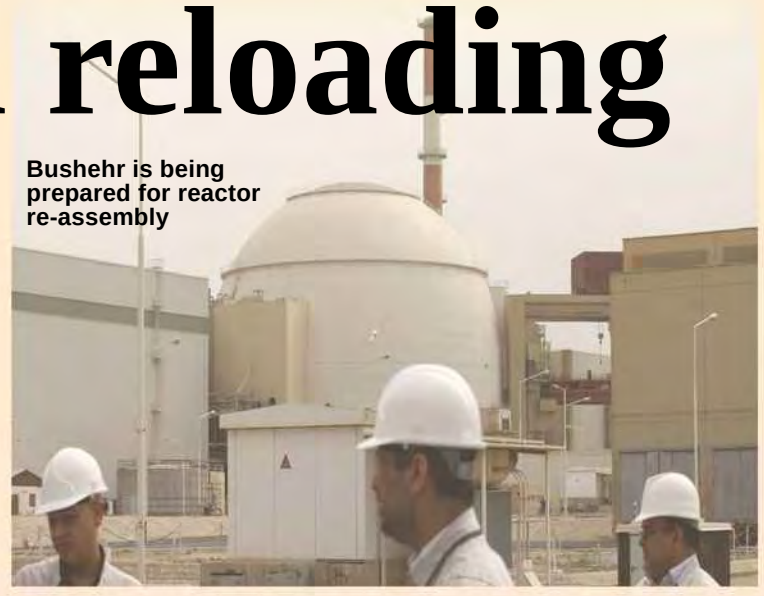
The Russian firm, which is completing construction of Bushehr, said in a statement that it had started to reload fuel but did not give further details of when it would be able to start operating the plant.

Repeated delays in the power plant project have caused the Iranian parliament to launch an investigation, the *Associated Press* reported last month.

The head of the Atomic Energy Organisation of Iran (AEOI), Fereidoon Abbasi, also said last month that the country was planning to build several nuclear research reactors and that it was ready to install centrifuges at a newly-built uranium enrichment site near Tehran.

He said that the International Atomic Energy Agency (IAEA) would be informed of the centrifuges, which are needed to enrich uranium to fuel the research reactors.

At the Bushehr site, Atomstroyexport has washed the plant's fuel assemblies and cleaned the reactor pressure vessel to remove the possibility of metal particles found in a cooling pump in February, which might be contaminating the fuel assemblies.



Bushehr is being prepared for reactor re-assembly

France joins Tunisia solar plan

France is to help Tunisia implement a number of renewable energy projects after the two countries signed an agreement in late March.

The agreement falls under the Tunisian Solar Plan and the Mediterranean Solar Plan and would also involve the development of grid interconnections to transfer solar and wind energy to Europe.

Tunisia has put renewable energy development at the heart of its energy programme in order to reduce its dependence on oil and gas imports. It is planning to increase the share of renewable energy in the energy mix to four per cent by 2014.

Tunisia also wants to double current levels of energy exchanges with the European Union by 2016.

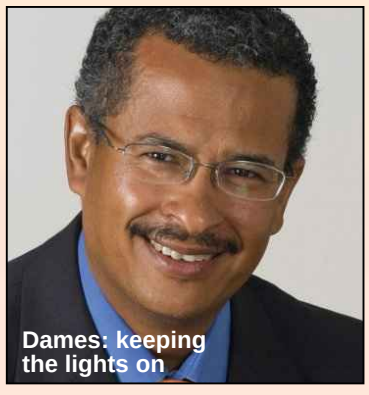
Eskom makes winter forecast

Electricity supplies in South Africa will remain tight for the next five years and particularly in 2011 and 2012, according to the country's national utility, Eskom.

The company has set out its plans for meeting electricity demand in the coming winter months, when rising demand will increase the load on an already tight power system.

"We are managing a tight power system. We are on alert and we will continue to communicate with our stakeholders on the state of the system," said Brian Dames, Eskom Chief Executive. "The winter season will be even more challenging, but Eskom is working actively to improve supply and reduce demand in order to manage increased risks to the system."

Both Eskom and the South African government has urged citizens to use electricity prudently. Innovative supply-side initiatives, active demand side management and "the cooperation of 49 million South Africans" have enabled Eskom to keep the lights on so far, noted Dames.



Dames: keeping the lights on

Electricity demand is set to continue rising leading to a continued tight supply situation over the next few years in spite of new generating capacity coming on line.

Eskom says that its winter plans include contracting of 373 MW of power from independent power producers and improving plant performance to boost power station output.

Saudi Arabia plans nuclear talks

Saudi Arabia is making further inroads into its plans for a nuclear energy programme, announcing plans to hold talks with China over a nuclear cooperation agreement.

The move follows the signing of a nuclear cooperation agreement with France in February, and would call for the two countries to cooperate in the fields of production, use and transfer of knowledge regarding the peaceful use of nuclear energy.

Saudi Arabia is pursuing a nuclear energy programme in order to preserve its vast oil reserves and meet growing energy needs. Peak power demand in the Kingdom is expected to triple over the next two decades from 43 GW in the summer of 2010 to more than 120 GW in 2030.

The country is also planning to increase the use of solar and other renewable forms of energy.

Tepco considers government support schemes

Japanese utility Tepco wants to remain a private company but the mounting costs of the earthquake, tsunami and nuclear disaster may mean that nationalisation is the only way forward.

Siân Crampsie

The Japanese government is considering how best to provide financial support to Tokyo Electric Power Company (Tepco) in the wake of the March earthquake and tsunami.

The beleaguered utility has been ordered to start paying compensation to people affected by the nuclear disaster at the Fukushima Daiichi power plant.

Its share price has plunged by 80 per cent since the March 11 natural disasters while its long-term credit ratings have been downgraded.

There is widespread concern that the utility, which supplies almost 30 per cent of Japan's electricity, might collapse under the financial burdens that it faces for remediation work at Fukushima, fuel bills for emergency generation needs and compensation. In March it secured $25 billion of emergency funding from three of Japan's largest banks.

"Given reconstruction costs, including LNG and other fuel costs, the situation is such that no matter how much we have, it won't be enough," said Tepco chairman, Tsunehisa Katsumata. "We will discuss the matter with the government and make efforts to ensure we do not run out of funds."

Tohoku Electric Power, the utility that supplies northern parts of Japan that have been severely affected by the earthquake, secured in March a $362 million emergency loan from the Japanese government to fund repairs and other costs related to the disaster.

The Japanese government is reported to have been considering a nationalisation plan for Tepco that would involve the acquisition by the government of a majority stake in the utility. This would help to provide financial stability and certainty but would only be a short-term measure.

Tepco officials are thought to be opposed to this plan, however, favouring instead the creation of a fund that would provide the utility with loans.

Compensation claims related to the disaster could amount to anything from Y1 trillion ($12.2 billion) to Y10 trillion, depending on how long it takes the company to regain control of the Fukushima reactors, according to recent analysis from investment bank Merrill Lynch.

Katsumata: Tepco is in need of funds

Ratings agency Moody's said on its website that the "enormous costs" faced by Tepco would "inevitably increase Tepco's already high debt leverage and could result in substantial rate increases that its residential and industrial customers may not be able to tolerate over the near term. These costs could lead to losses for at least the next two years if the company cannot increase the rates substantially".

Tepco is hoping that the Japanese government will declare that the March 11 events constitute an "unusually severe natural disaster", making it, and not Tepco, liable for the compensation claims.

The government has given no indication that it will make such a declaration and markets are for now assuming that Tepco will be wholly liable.

Tepco is also facing criticism for its handling of the disaster – in particular its failure to start sea water cooling operations more quickly – and for its decision to locate back-up generators at Fukushima at basement level, below an inadequate sea defence wall.

Questions have also been raised about Japan's nuclear regulatory system and the close ties between regulators and the industry.

In April, the government declared a ban on the practice of "amakudari", or "descent from heaven", through which senior civil servants involved in regulation take jobs at electric utilities after retirement.

GE continues industrial push

- Converteam will underpin key growth sectors
- New facility marks solar market push

General Electric has continued its spending spree in the market for industrial energy products with a $3.2 billion deal to acquire 90 per cent of Converteam, a privately owned maker of power conversion equipment.

The deal follows GE's recent acquisition of Dresser and the well support unit of John Wood Group, and will add "significant product and service capabilities" in markets such as power electronics, industrial automation and process controls, says GE, which has also announced plans for new investments in its solar power business.

The recent developments are part of the company's plans to reinforce its industrial roots in order to support a push into fast-growing sectors such as oil and gas, and renewable energy.

France-based Converteam's portfolio of products include drives, power electronics, generators and controls that can replace or improve mechanical processes to improve efficiency and reliability and reduce maintenance needs. They can be applied across a broad range of industrial sectors – ranging from metals and mining to natural gas and electricity generation – that together were worth $30 billion in 2010, according to GE.

"High-efficiency, fully electric solutions represent a mega-trend across the global energy landscape," said John Krenicki, vice chairman, president and CEO of GE Energy. "Our customers in key industries increasingly demand more reliable, efficient and flexible solutions in order to improve their competitiveness."

Being part of GE would give Converteam the opportunity for "further development and growth", said the company's CEO and president Pierre Bastid. GE will run Converteam as a standalone business but plans to boost the company's revenues by selling globally through its established sales network.

Under the deal, Converteam's senior management will retain approximately a 10 per cent stake in the company. Converteam recently announced 2010 sales of approximately $1.5 billion and EBITDA of around $239 million, with approximately 36 per cent growth in orders versus 2009.

GE has also announced plans to construct a 400 MW solar panel manufacturing facility in the USA by 2013 to help it make a concerted push into the global market for thin film solar technology, currently dominated by First Solar.

The announcement marks a milestone in the company's thin film solar strategy, which began in 2007 with the acquisition of a stake in start-up firm Primestar Solar.

GE said in April that its has now taken full control of the company and that one of its full-size thin film solar panels had been independently certified as the most efficient ever.

"Over the last decade GE has become one of the world's major wind turbine manufacturers, and our investment in high-tech solar products will help us continue to grow our position in the renewable energy industry," said Victor Abate, vice president of GE's renewable energy business. "We are addressing the biggest barrier for the mainstream adoption of solar technology – cost – and the … certification proves that we are on track to deliver the most affordable solutions for our customers."

Abate said: "Our plan to open a US solar manufacturing facility… is just the first phase in a global, multi-gigawatt roadmap."

GE also announced more than 100 MW of new commercial agreements for solar thin film products, including panels, inverters and total solar power plants.

BP hopes for resolution in Russian partnership

BP is still hopeful of reaching an agreement with its Russian partners in the TNK-BP joint venture in order to secure its proposed multi-billion dollar deal with Rosneft.

The UK firm is continuing arbitration proceedings with Alfa-Access-Renova (AAR), which owns half of TNK-BP and which claims that BP broke their partnership agreement by entering into a share-swap agreement with Russian oil giant Rosneft.

In April BP agreed a one-month extension to the $16 billion share swap with Rosneft that has been blocked by an injunction from an arbitration tribunal. BP says that it remains committed to TNK-BP as its primary business vehicle in Russia.

BP's proposed deal with Rosneft would give the UK firm access to exploration opportunities in the Russian Arctic.

Tognum rejects Daimler-RR offer

The management and supervisory boards of Tognum say that a successful takeover of the company by Daimler-Rolls Royce joint venture would help to strengthen its leadership in distributed energy and marine propulsion systems.

Engine Holding GmbH has made a takeover offer for Tognum with an offer price of €24 per share plus a commitment to retain Friedrichshafen, Germany, as the company's headquarters and main research and development location.

Tognum's board says the offer price is too low and has recommended that shareholders reject it. The firm said the offer price "fails to reflect the capital expenditure carried out in recent years and the growth prospects for the Tognum Group that are associated with this capital expenditure alone".

It also said that the offer price does not reflect Tognum's long term business plan nor the reduction of company debt by €300 million between July 2007 and the end of 2010.

Americas

Xcel Energy selects Metso for modernisation

Metso Corporation is to undertake a six-year project to modernise the automation systems at Xcel Energy's Sherburne County Generating Plant in Becker, Minn., USA, after being awarded a contract by the US electricity utility.

The project at the three-unit, 2400 MW generating station will be carried out in phases with work coinciding with major plant outages between 2011 and 2017. The first phase has already started and will be completed in 2013, says Metso.

Enmax awards Shepard contract

Enmax Shepard Corporation, a subsidiary of Enmax Energy Corporation, has awarded a contract for the construction of the Shepard Energy Centre in southeast Calgary to KBV, a joint venture between Kiewit Energy Canada Corp. and Black & Veatch Canada Company.

KBV will complete the final design and construct the 800 MW power plant, which will operate on natural gas and provide around half of the electricity requirements of the city of Calgary.

Detailed engineering of the Shepard Energy Centre is already well underway. The project is comprised of two 240 MW natural gas fired turbine generators and one 320 MW steam turbine generator.

Commercial operation of the plant is scheduled for August 2015.

Siemens to build simple cycle plant in Peru

Peru-based Termochilca SAC has awarded Siemens Energy a contract for the turnkey construction of the Santo Domingo de los Olleros simple cycle power plant in Peru's Lima province.

Siemens will be responsible for engineering, procurement and construction of the 200 MW plant, which will boost energy supplies to Peru's fast-growing market. Commercial operation is scheduled for late 2012.

Included in the $200 million order are an SGT6-5000F gas turbine, electric generator SGEN6-1000A, and the entire electrical and SPPA-T3000 instrumentation and control equipment. Siemens has also signed a long-term service agreement with Termochilca for the plant.

ABB wins CHESF order

Brazilian electric utility CHESF has awarded ABB an order worth $34 million to supply two air-insulated switchgear (AIS) substations and expand three existing substations in northeastern Brazil.

As part of the turnkey project, ABB is responsible for the design, engineering, supply, and commissioning of the substations, which will facilitate the integration of renewable energy with the grid as well as enhance voltage stability and system performance during contingencies. One of the new substations will be equipped with static var compensator (SVC) units.

US Army to demonstrate energy storage system

ZBB Energy Corporation's ZESS V3 zinc bromide flow battery technology is to be used at a US Army facility in Ft. Sill, Oklahoma to demonstrate the use of micro-grid technologies at US Army bases.

ZBB Energy has signed a contract with Eaton Corporation to provide a 500 kWh energy storage system to the Ft. Sill bases. The system will be evaluated by the US Army Engineer Research and Development Center and the Construction Engineering Research Laboratory for its ability to provide off-grid, islanded power.

ZBB's ZESS V3 technology is a Zinc Bromide flow battery designed to serve as an advanced electrical energy storage device, constructed from environmentally friendly materials that provide for long service life and advanced performance when compared with traditional chemical batteries.

Asia Pacific

ABB to upgrade Wanakbori controls

The Gujurat State Electricity Company Limited (GSECL) has awarded ABB a contract worth $18 million to renovate and modernise the control systems at the 1260 MW Wanakbori thermal power plant in the western Indian state of Gujurat.

Under the contract ABB will install its Symphony distributed control system (DCS) and supply the complete control and instrumentation package for the 6x210 MW thermal power plant. The solution will include diagnostics and optimisation packages, turbine controls, steam generator control, station controls and instrumentation, a steam and water analysis system (SWAS), flue gas analysers, control valves, actuators and positioners.

The project is scheduled to be completed by 2013.

China Datang selects Vestas units

Denmark's Vestas is to provide China Datang Corporation Renewable Power with 25 wind turbine units for a new project near the city of Hulunbeier in the north eastern part of Inner Mongolia Autonomous Region, China.

Under the contract Vestas will supply its V90-2.0 MW units and a SCADA solution as well as undertake delivery, installation and commissioning.

The 50 MW project will be completed in just five months, says Vestas.

Areva to install solar augmentation

Areva Solar has been awarded a contract to install a 44 MW solar thermal augmentation project at a 750 MW coal-fired power station in Queensland, Australia. The project represents the largest solar project in the Southern Hemisphere and the world's largest solar/coal-fired power augmentation project.

Under the contracts Areva will install its Compact Linear Fresnel Reflector (CLFR) technology to boost the output of CS Energy's Kogan Creek power station. The A$105 million project represents the largest single deployment of Areva's solar thermal technology in the world and will be completed in 2013.

The CLFR solar technology will use the sun's energy to generate steam that will be supplied to the coal plant's existing steam turbine. The process will increase the electrical output as well as the fuel efficiency of Kogan Creek.

South Korean firms win hydro bids

South Korea's Daewoo Engineering & Construction Co. has won a bid for the construction of a 60 MW hydropower plant in North Sumatra, Indonesia. The contract is worth Rp 2.5 trillion ($290 million), according to reports.

Meanwhile another South Korean firm, Hyundai Engineering, has won a contract alongside Indonesia's state construction firm PT Pembangunan Perumahan to build an 89 MW hydropower plant in Indonesia's Aceh province.

Both power plants are expected to be completed in 2013.

ABB wins China UHVDC link

The State Grid Corporation of China (SGCC) has awarded ABB a $120 million contract to engineer and supply key equipment for the Jinping-Sunan 800 kV Ultra High Voltage Direct Current (UHVDC) power transmission project.

ABB will supply key components for both converter stations, including converter valves, the control and protection system and DC yard equipment. ABB earlier announced that it has also been selected to supply the 800 kV UHVDC transformers for both converter stations.

The 2090 km power link will transport clean hydropower from Sichuan province in central-western China to the highly industrialised coastal area in the eastern province of Jiangsu. The UHVDC link will have a rated capacity of 7200 MW, and is expected to be energised in 2013.

Alstom wins Manjung contract

Alstom and its partner China Machinery Import and Export Corporation (CMIEC) have won a contract to build southeast Asia's first 1000 MW supercritical coal-fired power plant.

Under the contract with Tenaga Janamanjung Sdn Bhd. a subsidiary of Malaysia's state-controlled power generation, transmission and distribution company Tenaga Nasional Bhd (TNB), Alstom and CMIEC will be responsible for the engineering, procurement and construction of the new plant at Manjung, Malaysia.

Under the terms of the contract, Alstom will engineer, procure, construct and commission a 1000 MW steam turbine, a generator, a supercritical boiler and auxiliaries. Alstom will also supply and install its latest Alspa Series 6 distributed control system, and environmental control systems to cut emissions.

The plant is expected to come online in 2015.

Europe

Gas Natural Fenosa awards O&M contract

Alstom has secured a contract with Gas Natural Fenosa for the maintenance and operational support of the Cartagena gas-fired combined cycle power plant in Spain. The 20-year contract is worth more than €270 million.

Gas Natural Fenosa's Cartagena plant was designed, built and commissioned by Alstom in 2006. It comprises three 400 MW combined cycle units, each including a GT26 gas turbine, a heat recovery steam generator, a steam turbine, and a generator supplied by Alstom.

Under the terms of the contract, Alstom will provide maintenance and operational support for all of the plant's core equipment.

Emerson selected for Ambarli modernisation

Emerson Process Management is to automate two power units at Turkey's Ambarli power plant that are being rehabilitated and repowered to help meet increasing energy demand in the country.

Emerson will install its PlantWeb digital plant architecture with the Ovation expert control system to replace the outdated controls at the existing plant, which is being modernised by engineering contractor EPP to improve performance, reduce environmental impact and increase total plant output.

Emerson specialists will manage the automation project and be responsible for the design, procurement and installation of all instrumentation and control systems, as well as overseeing the commissioning and start-up of both units, scheduled for April 2012.

Alstom secures ECO 110 order

Alstom has secured its first ever order for its ECO 110 wind turbine by signing a contract with wind farm developer Eole Generation for the construction of the Landes de Couesme wind farm near La Gacilly in Brittany, France.

The wind farm will have a total installed capacity of 33 MW and will feature 11 of Alstom's ECO 110 units. Alstom's contract also includes the installation of the units as well as a five-year operation and maintenance agreement.

Poland expands with GE wind turbines

GE has won a contract to supply its 2.5 MW wind turbines to a new facility being developed in northwest Poland.

The USA-based firm will supply three of its 2.5-100 units to KSM Energia Sp. z.o.o., owner of the Zensko wind energy project near the city of Krzecin in Choszczno County, West-Pomerania Province. The wind farm is being developed by KSM Energia's majority shareholder Renpro Sp. z.o.o.

GE also has signed a ten-year, full service agreement with KSM Energia. The wind farm is due to enter service in the fourth quarter of 2011.

International

Saudi Arabia reinforces grid

The Saudi Electricity Company (SEC) has awarded Alstom Grid two contracts worth €57 million for the extension of five substations and the construction of two new ones.

Alstom Grid's scope includes complete project management from initial design, procurement and logistics, to commissioning, as well as the supply of the 132 kV power transformers, capacitor banks, and automation solutions. The projects are expected to be completed by December 2012.

ABB boosts Congo transmission

Société Nationale d'Électricité (SNEL), the national power utility in the Democratic Republic of Congo (DRC), has placed an order worth $41 million with ABB to refurbish and expand three substations in the southern province of Katanga.

ABB's turnkey solution will include the design, engineering, supply, installation and commissioning of three 220 kV air-insulated switchgear (AIS) substations and an associated load dispatch centre. The project will boost transmission capacity and help to meet increasing demand for electricity in DRC.

One substation will be equipped with an SVC (static var compensator) unit to improve voltage stability and system performance.

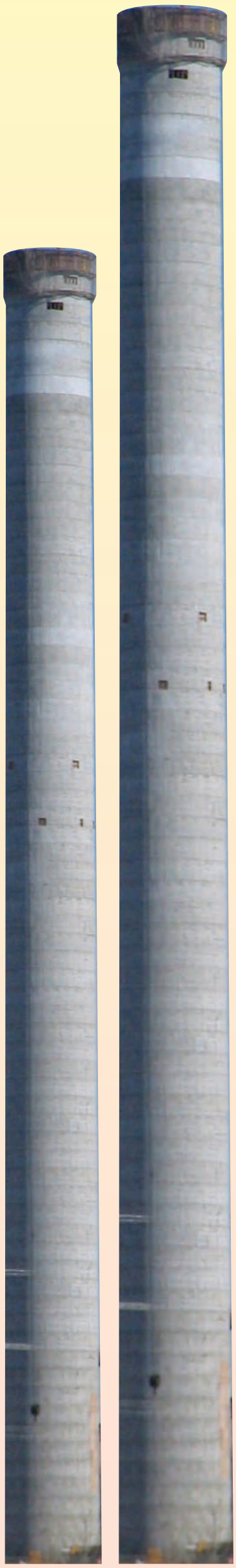
The project is part of SNEL's comprehensive grid rehabilitation programme, supported by multilateral development funding.

Alstom signs Russia contract

Alstom has signed a contract with the Russian company RESAD to supply one GT13E2 gas turbine to the Molzhaninovka power plant in Russia.

The gas turbine unit will be used in the first phase of the Molzhaninovka gas fired combined cycle power plant near Moscow, which is scheduled to be fully operational by December 2012.

The contract signifies the first entry of Alstom's GT13E2 to the Russian market.



Switching focus to renewables?

With the European Renewable Energy Council conference just weeks away, *TEI Times* caught up with **Christine Lins**, the Council's Secretary General, to hear her views on the issues currently facing the sector and get a glimpse of what lies ahead.

On May 24th, delegates gathering at the European Renewable Energy Council (EREC) conference in Brussels will have plenty to discuss as renewables is thrust back into the spotlight following the nuclear crisis in Japan and the ongoing turmoil in the Middle East and north Africa.

As EREC's Secretary General, Christine Lins explained: "EREC 2011 comes at a time when renewables is very high on the agenda – obviously because of the tragic events in Japan, following which numerous countries revised their future energy strategies, as well as the high oil prices partly caused by the political circumstances in north Africa. Europe is also in the process of developing its long term energy policy, focussing on the next 40 years. This will be the major conference to debate long term renewable policies, and EREC will not only outline its vision for the next 40 years but will also focus on the need for a binding target for renewable energy and energy efficiency for 2030."

This last year has been an interesting one for the European renewable energy scene. In 2010, countries from the EU member states submitted their renewable energy action plans outlining how they each plan to fulfil their binding 2020 targets. The plans were due in June 2010 and the last was submitted at the start of 2011.

Commenting on the plans Lins said: "Twenty five of the 27 member states indicated they would achieve or overshoot their national 2020 target. When you add them all up, we go beyond the required 20 per cent, arriving at 20.7 per cent. It is interesting to note that countries see the inherent benefits of exploiting renewables – not only the environmental benefits but also the improved security of energy supply that comes from using indigenous resources. There is also the job creation aspect."

Although reaching the 20 per cent goal is ambitious, when considering the current use of renewables, EREC believes it is absolutely feasible and goes as far to say that 25 per cent of energy consumption in the EU could be met by renewables by 2020.

"We have seen lots of progress in the past," said Lins. "The 1997 Renewables White Paper set out objectives for 2010. Photovoltaics reached an installed capacity of 28 GW in 2010 – nine times more than the 1997 target. For wind, the objective was 40 GW. This was reached in 2005 and we ended up with 85 GW in 2010." She noted, however, that other sectors such as biomass and solar thermal are lagging behind.

Nevertheless, EREC's continued optimism is based on "the leading role renewable energy already plays today". When looking to the power sector, it believes that renewables are set to dominate the share of newly installed electricity capacity. Certainly there has been a tremendous increase, from 1.3 GW in 1995 to 13.3 GW in 2008, and 17.3 GW in 2009. In 2010, more renewable electricity capacity was installed in the EU than ever before – a record of 22.7 GW.

"Clearly this trend will continue towards 2020, but needs to be extended to other sectors like heating and cooling too. The potential in heating and cooling are not fully tapped due to a lack of firm policy in the area. But with the new directive we are confident the gap can be closed," said Lins.

Indeed having the stable policy framework that is needed to attract the required private investment in renewables is a prerequisite to achieving the ambitious 2020 targets.

According to a recent study published by EREC called *RE-thinking 2050*, cumulative investment needs in the renewables sector for 2020 is calculated at €963 billion.

Attracting this level of investment will largely depend on government policy. Lins is critical of recent policy changes in some countries that will no doubt prove damaging to efforts to attract investment.

"Support tariffs in Spain and the Czech Republic, for example, were cut retroactively. This is a disaster for the sector. It would be a disaster in any sector. If investors cannot calculate with a stable framework, it puts the economic viability of projects at stake. [Policy] stability is critical to getting us on track and ensuring that we reach the targets."

Lins believes that subsidies should be reduced as the market develops but in a controlled and transparent manner. "In Germany, there was dialogue between politicians and industry. Industry is absolutely willing to discuss tariff adjustments. With decreasing costs through economies of scale etc., the price of equipment is falling. If tariff adjustments can be aligned with forecasted decreasing costs, clearly this is the way to go."

EREC's Christine Lins is critical of recent policy changes in some countries that may damage efforts to attract investment

An economy based on renewables will also need massive investment in infrastructure, especially in rolling out smart grid and supergrid projects. "This will need a European approach and a way forward on how to finance these infrastructure proposals," noted Lins.

So far, pan-European efforts to attract financing to renewables have been questionable. Commenting on the Emissions Trading Scheme (ETS), Europe's flagship tool for cutting carbon emissions, Lins said: "So far we have not seen the ETS as the main driver for renewables growth in Europe. Perhaps it will work better after the revision. At the moment, the main driver is the individual country policy framework. Once the framework is in place, each government needs to stick to it and work to achieve the targets."

Lins points out Germany as a good example of what can be achieved with the right, and stable, policy framework. "Germany is now the most advanced country in Europe for renewables and its feed-in tariff approach is now the reference for the sector. The EU renewables sector now employs around 550 000 people of which 350 000 are in Germany."

Some argue that adopting national strategies as opposed to taking a harmonised pan-European approach to increase the use of renewables results in projects being built in the country with the most attractive subsidies. It has been said that this will result in sub-optimal solutions that will increase the cost of electricity.

The European Commission does not see the need for harmonisation at this stage. Lins agreed: "An EU-wide strategy is not necessary for the time being. The focus now has to be the 2020 targets. According to the National Action Plans, all the countries except Italy and Luxembourg have committed to fulfilling or exceeding their targets from projects within the country. We think this is an important first step. To get us to higher shares of renewables – we are talking about 45 per cent in 2030 and 100 per cent in 2050 – we need to exploit the potential in all member states. The challenge of the new Renewables Directive is to have roll-out of renewables in all countries. So far, we have six or seven champions but it is important that each and every member state gets going and sets its own strategy, as different countries have different [renewable] potential."

Yet policy is not the only factor that may influence the uptake of renewables. The availability of cheap gas, which also has an important role in achieving emission reduction targets, will have an impact on utility choices.

However, Lins does not believe that the current interest in gas will be detrimental. "Gas is an interesting development. In 2010 we saw a significant increase in [gas fired generating] capacity installed in Europe. Gas is more flexible and modular than nuclear and so can become the transition fuel on the way to a 100 per cent renewables economy. We don't see it as a threat but as a complimentary energy source until renewables can provide all the energy services that are needed."

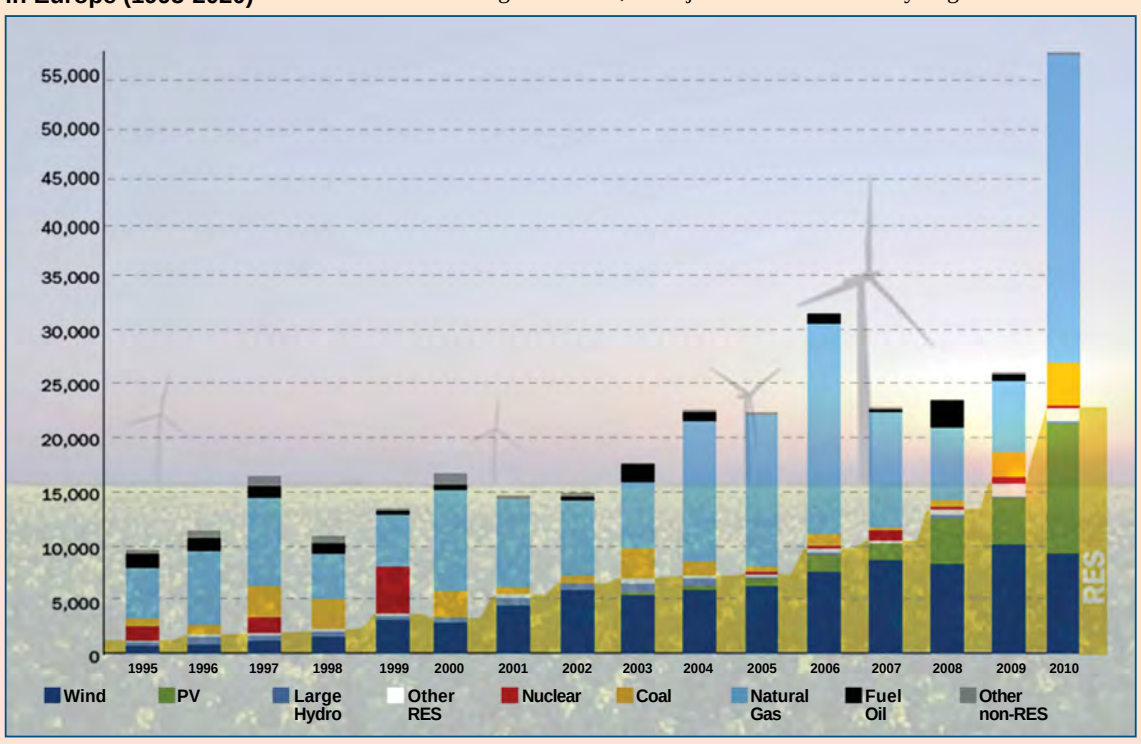
The events of the last few months may have perhaps made governments realise the importance of renewables and energy efficiency in their energy future. Whether they can provide 100 per cent of Europe's electricity needs is a point of debate.

Lins believes they can. "There are numerous studies such as those by the European Climate Foundation, Greenpeace and WWF that indicate renewables can provide 100 per cent of our energy by 2050. The European Commission is also working on different scenarios and expects to come out with a renewables and energy efficiency scenario that points in the same direction."

The EC will give its views on European energy policy in 2050 in a special session at EREC 2011. Further, the task of how to manage such high integration of renewables in the grid will be addressed by a new book that will launched by the International Energy Agency at the conference.

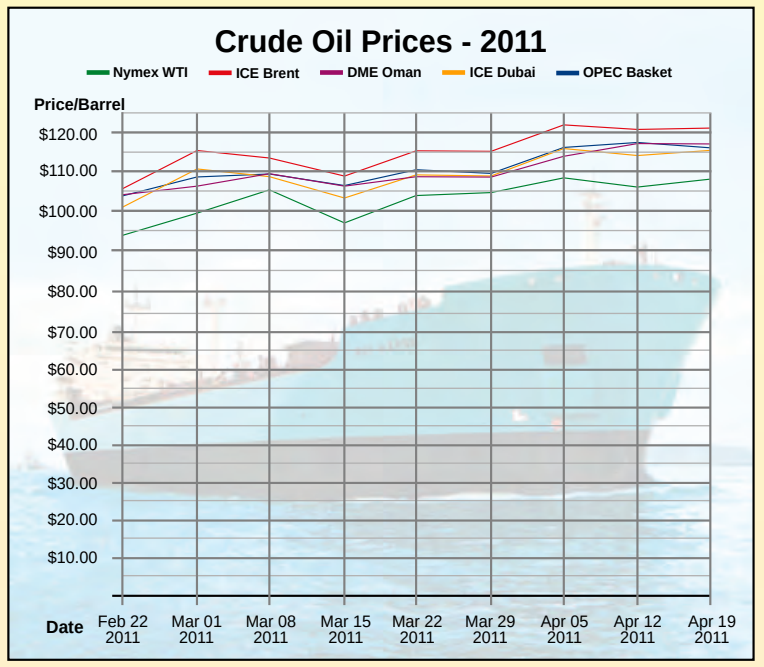
While renewable proponents will present an interesting case of what is possible, many will argue that 100 per cent renewables is not feasible. The debates at EREC 2011 and beyond will no doubt continue be interesting.

New installed generating capacity of renewable energy in Europe (1995-2020)



Oil

Crude prices move higher as Saudi Arabia says market over-supplied



- Saudi Arabia cuts output by around 800 000 b/d
- Remedy for high prices may ultimately be high prices themselves

David Gregory

Crude oil prices continued to rise during April as unrelenting violence and civil unrest in the Middle East and North Africa exacerbate market worries. West Texas Intermediate (WTI) crude moved above $110/b in mid-April and Brent exceeded $123/b, reinforcing concerns that high oil prices could eventually undermine the economic recovery. Economists are questioning how long before high prices lead to 'demand destruction' – the point where crude gets too expensive to afford.

Price increases are for the most part being attributed to speculation in the market, which is to be expected under the political circumstances in the Arab world, yet demand is declining and high prices are being increasingly seen as the reason. While Opec maintains that the market is well supplied, consumers argue that the only way to bring prices down is to put more crude on the table.

Saudi Arabia considers the market well enough supplied to have reduced production during March. Speaking in Kuwait in mid-April, Saudi Minister of Petroleum and Mineral Resources, Ali al-Naimi said Saudi Arabia cut output by around 800 000 b/d that month to 8.29 million b/d from 9.12 million b/d in February, when production went up in order to cover the loss of Libyan exports.

Mr. al-Naimi said Saudi production might be up slightly in April, but he said that he was disclosing the February and March figures to show that the market is over supplied. He added, however, that Saudi Arabia would step in and provide extra crude if the market showed it was necessary. The country possesses the bulk of the world's spare capacity, some 3.5 million b/d, with a total production capacity of 12.5 million b/d.

Gone are the days when Saudi Arabia considered $75/b a "perfect price." In the wake of unrest in the Middle East, Riyadh has promised some $129 billion to its citizens in the form of handouts and benefits and it appears that now despite needing the $75/b price to cover the cost of oil industry investments, as was argued at the time, Saudi Arabia will need a higher price for crude to cover its largesse.

Other Opec members have stated that they believe the world market can tolerate prices of $90-$100-or more per barrel, a view that consumer countries have yet to endorse.

Meanwhile International Energy Agency Executive Director Nobuo Tanaka said last month that high prices are a threat to growth and economic recovery. "We observed already that high prices are pressuring down the growth of oil demand in some countries like China and the US," Mr. Tanaka was quoted by *Platts* as saying during a visit to Kuwait.

In the April issue of its *Oil Market Report*, the IEA said there are "real risks" that a sustained $100/b-plus price environment will prove incompatible with the expected pace of economic recovery. "Economic impacts from high prices are never instantaneous, and often take months to materialise, but preliminary data from early-2011 already show signs of oil demand slow-down. Unfortunately, the surest remedy for high prices may ultimately prove to be high prices themselves," the IEA said.

The agency forecast global demand to average 89.4 million b/d in during 2011, an increase of 1.6 per cent or 1.4 million b/d over 2010. But it noted that this forecast for demand growth is significantly less than the 2.9 million b/d estimated for 2010.

The London-based Centre for Global Energy Studies (CGES) said in its April 19 *Monthly Oil Report* that despite assertions by Opec that the market is well supplied, crude prices are reflecting a "tightness" that has been increasing since mid-2010.

CGES said the similarities between the rising prices of 2008 and current price rises are worrying. While producers struggled to keep pace with rapidly growing demand in the developing world in 2008, it said, demand growth now is more moderate but producers are being slow to respond.

It pointed out that most of the 1.5 million b/d produced by Libya and which is now off the market has not been replaced by Opec and that there is no sign that the organisation intends to increase output anytime soon.

This means, CGES said, "that any rebalancing will have to come from stock draws in the short run and from lower demand later on, brought about by even higher prices."

Gas

Shtokman decision set for end 2011

A final investment decision on the Shtokman gas and LNG project will be delayed to the end of this year but despite the challenges, partners remain determined.

Mark Goetz

The partners in Russia's giant Shtokman gas and LNG project have stated they plan to make a final investment decision (FID) by the end of 2011. The project, designed to develop and exploit 3.9 trillion m^3 of gas and 56 million tons of condensate in the Barents Sea, is expected to require an initial investment of at least $15 billion.

Partners in Shtokman Development AG (SDAG) – Russia's Gazprom (51 per cent), France's Total (25 per cent) and Norway's Statoil (24 per cent) – met in Zurich in mid-April and announced that the FID would be delayed, but said they had also reached agreement on some technical aspects of the project.

Last year the partners announced a three-year delay in the project because of the impact of the 2008 global economic downturn on international gas demand, and also because of the advent in the US of unconventional gas supplies in the form of shale gas. The gas pipeline aspect of the project is scheduled to come on-stream in 2016, while LNG will come into production the following year.

Originally, the US was a prime target for Shtokman LNG, but with shale gas now expected to meet US gas demand for years to come, placing Shtokman LNG on the global market remains a question. The gas market in Europe is still unsure, although the consequences of the March earthquake in Japan is seen as bolstering LNG demand in Asia and ultimately in other markets including Europe.

Furthermore, Russia has yet to clarify the tax regime under which Shtokman will operate, another issue that partners will have to address. They have made it clear that all fiscal issues related to the project need to be clarified before they can move forward with financing a project that is expected to be very demanding.

Discussions with the Russian government on the regime are expected to get under way soon. Shtokman is said to be lobbying for major tax concessions, without which the project might not be viable.

SDAG's financial consultants are due to make a final estimate on capital spending in September following the completion of the tendering process for both onshore and offshore schemes. The tendering process for offshore work is expected to be complete by June, while tendering for the onshore is to start this month (May). SDAG will submit all calculations to the partners in September and during September-October the consortium's financial consultants will determine financing for the project, particularly how much outside investment will be required.

Despite the challenges, partners remain determined. "The Shtokman project is a priority for all shareholders," a statement released by SDAG on April 13 stated. "The shareholders regard development of the Shtokman gas condensate field as a single integrated project to group together gas production, transport and LNG production," it said. The Shtokman field lies within the Arctic Circle, some 600 km north of Murmansk.

Shtokman is a three-phase project that will be developed over 50 years. Phase 1 calls for the production of 23.7 billion m^3 per year, half of which will be routed to Europe and delivered through the Nord Stream pipeline through the Baltic Sea. The other half will produce around 7.5 million tons per year of LNG.

Phase 1 would require installing four platforms and drilling 16 production wells. By the completion of Phase 3, some 68 wells would produce a total of 71 billion m^3 per year, of which 30 million tons per year would be processed into LNG.

Meanwhile, Gazprom on April 19 released a statement announcing that it has adopted an updated programme for hydrocarbon resources development on Russia's continental shelf until 2030. Programme implementation would enable Gazprom to produce about 200 billion m^3 per year of natural gas and around 10 million tons of oil by that year, the statement said, adding that this calculation excluded the Sakhalin II project.

Gazprom said initial aggregate hydrocarbon resources on the Russian continental shelf stood at around 100 billion tons of fuel equivalent, 80 per cent of which is gas.

Gazprom said by 2030, the programme is expected to replenish the company's reserves with more than 11 billion tons of fuel equivalent through geological exploration of the Russian shelf.

An efficient path to emissions reduction

Coal plants in the US are under pressure to reduce carbon dioxide emissions. The Electric Power Research Institute believes that improving thermal efficiency represents a lower cost alternative to carbon capture and storage.

Dr. Jeffrey Phillips and **Sam Korellis**

Today's coal-fired power plants face a number of economic and environmental challenges as they seek to reduce carbon dioxide (CO_2) emissions, improve emissions controls, and curtail water use. One strategy for addressing these challenges involves research and development to improve the thermodynamic efficiency of new and existing coal power plants.

Basic thermodynamics dictate that power plants based on Rankine (i.e., steam) cycles can achieve higher thermal efficiencies by operating with steam conditions at higher temperatures and pressures. Increased plant efficiency enables fuel cost savings, reduces pollutant emissions, and cuts balance-of-plant costs, due to reduced size and water consumption.

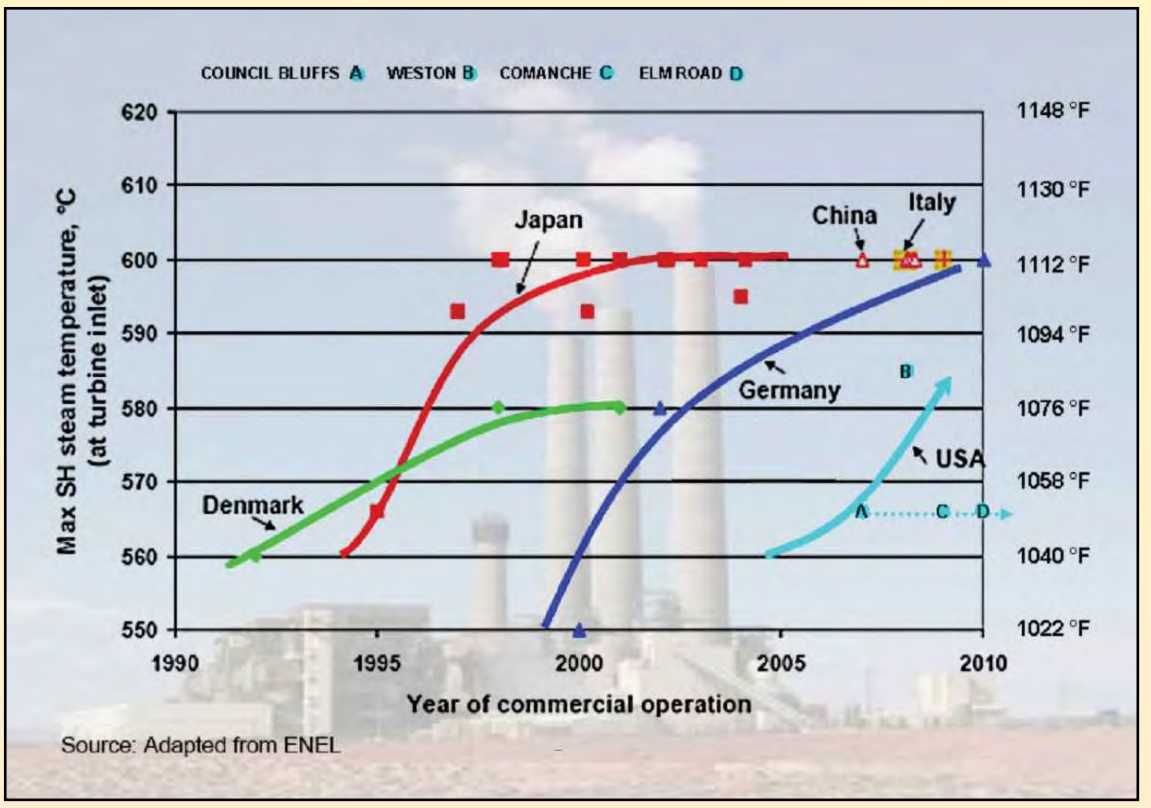
It is estimated that a nine percentage point efficiency gain results in a 20 per cent reduction in CO_2 emissions. In addition, recent analysis by the Electric Power Research Institute (EPRI) has shown that, for new coal plants, increasing thermal efficiency by using more advanced materials in boilers and steam turbines could provide reductions in CO_2 emissions at a cost far lower than is predicted for any known CO_2 capture and storage technology.

Although the advantages of higher efficiency are many and compelling, efficiency improvements in coal power plants have been nearly stagnant over the past 50 years, especially when compared to natural gas-fired combined cycle power plants.

An analysis of the history of power generation in the US by Richard Hirsch shows that the maximum thermal efficiency of Rankine cycle power plants climbed steadily from 2.8 per cent in 1891 to 38.95 per cent in 1960, when the Eddystone Generating Station Unit no.1 was built near Philadelphia, Pennsylvania. Since then, no coal-fired power plant built in the US has had steam conditions that exceed Eddystone's, and the growth in the average efficiency of the US fleet has stagnated. That efficient Eddystone unit is now slated to cease operation in 2013.

In contrast to this lack of advancement in the efficiency of coal plants, gas turbines have undergone remarkable advances. In 1960, the Eddystone steam turbine had a design inlet temperature of 649°C (1200°F). This is still the highest turbine design inlet temperature of any commercial power plant worldwide. In that same year, the highest inlet temperature for a gas turbine was or 800°C (1472°F).

Over the next 50 years, Eddystone steam turbine inlet temperatures regressed 39°C (70°F) to 610°C (1130°F) to address fireside corrosion issues, while gas turbine inlet temperatures progressed almost 667°C (1200°F).



State-of-the-art in pulverised coal-fired power plant steam temperature

A significant part of this gas turbine advancement has been due to the use of advanced materials and advanced blading designs that incorporate continuous cooling, permitting operations at higher temperatures.

In 2001, the US Department of Energy (DOE) challenged US boiler and steam turbine suppliers to develop a pre-competitive R&D programme that would lead to higher efficiency coal-fired power plants with reduced CO_2 emissions.

The DOE believed that it was feasible to develop materials that would allow plants to operate successfully with main steam temperatures up to 760°C (1400°F). That effort has now led to the submittal of a code case to the ASME Boiler Code committee for a new material (Inconel 740) that would meet the DOE target.

Plants built with this material would constitute an advanced ultra-supercritical (A-USC) pulverised coal plant with the following conditions: 760°C, 345 bar[a] (1400°F, 5000 psia). Such plants would produce 14 per cent less CO_2 per MWh at an avoided cost of $15/ton of CO_2. By comparison, a new power plant typical of what might be built in the US today – i.e., a supercritical pulverised coal plant – would have main steam conditions of 582°C, 262 bar[a] (1080°F, 3800 psia).

No commercial power plant currently operates at the 760°C target. EPRI is currently working with the DOE consortium to advance that technology.

However, in Europe, Japan, and China, commercial coal power plants do operate at temperatures at and slightly above 593ºC (1100°F). EPRI refers to this class of power plants as "current ultra-supercritical" or "current USC" technology, and its analysis indicates that such plants in the US would provide a lower levelised cost of electricity over 30 years than subcritical coal power plants (541ºC, 179 bar[a] or 1005°F, 2600 psia main steam conditions).

The plants that operate with 593ºC steam temperatures typically use coal with low or moderate levels of sulphur. No plants firing high-sulphur, high-chlorine Illinois basin coal (which could accelerate corrosion) operate at or above 593°C.

One of the most recently built supercritical pulverised coal power plants in the US is the Trimble County Station Unit no. 2 owned by Louisville Gas & Electric and Kentucky Utilities. The 760 MW plant has a design main steam temperature of 579ºC (1075°F) and a design heat rate of 8662 Btu/kWh (39.7 per cent thermal efficiency on HHV basis) using a mixture of bituminous and sub-bituminous coal.

Advanced ultra-supercritical plants would produce 14 per cent less CO_2 per MWh

Southwestern Electric Power Company, a unit of American Electric Power, is building the first new ultra-supercritical plant in the US. The 600 MW John W. Turk, Jr. Power Plant, under construction in southwest Arkansas, will have design steam temperatures of 593ºC (1100°F) and a thermal efficiency between 39 and 40 per cent when firing sub-bituminous coal. The plant is expected to be commissioned in late 2012.

Besides increasing steam temperatures and pressures, there are a number of other ways of improving thermal efficiency in new coal power plants. EPRI's Advanced PC Guideline, published last year, explored several methods including recovery of low-temperature heat from the flue gas and reduced cooling tower approach temperature. In general, these would provide smaller boosts to the overall plant thermal efficiency than increasing steam turbine inlet temperature.

In addition to investigating heat rate improvement options for new plants, EPRI has studied options for improving the heat rate of existing coal-fired power plants.

Two years ago, EPRI developed a screening guide to many different improvement projects that could be economically attractive depending on a plant's specific situation. Last year, EPRI conducted a study that applied the screening guide for a large, US mid-western coal fleet owner to identify and rank 177 potential projects for reducing CO_2 emissions at its existing plants.

The mid-west study showed that approximately 60 projects across the fleet could be implemented at an avoided CO_2 cost of $0/ton or less. The "free" CO_2 reductions occur because the fuel saving is greater than the cost to implement the project. In addition, another 30 projects could be implemented at an avoided CO_2 cost of less than $26/ton.

The cumulative impact of implementing all of these projects would reduce the fleet's CO_2 emissions by approximately 3 per cent. This analysis shows that some "low-hanging fruit" are available for CO_2 emissions reductions in coal plants that individually may not account for a lot of CO_2 savings but taken together could add a meaningful contribution.

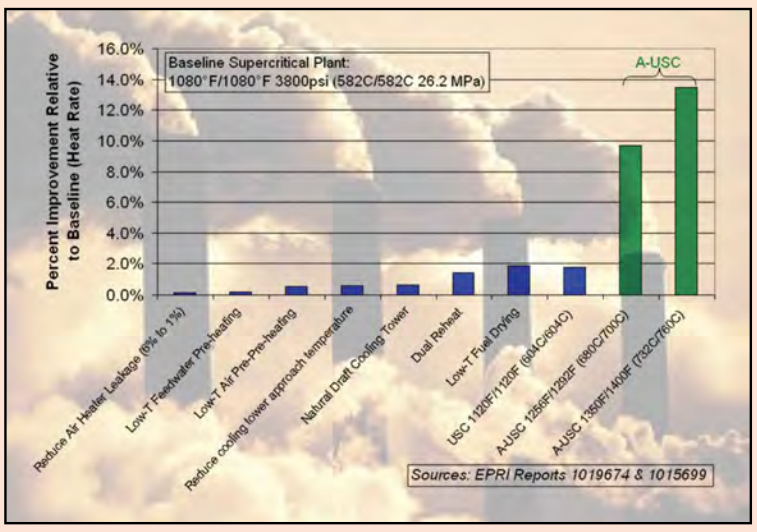
Some of the projects that were identified as having negative or zero costs for CO_2 reductions were:

- Automated boiler drains
- Improved air heater seals
- Circulating water strainers (to reduce fouling in cooling water heat exchangers)
- Condenser ball cleaning systems (reduces condenser fouling via on-line cleaning)
- Use of high-efficiency motors and variable-frequency drives for air compressors in station air systems.

In summary, improvements in the thermal efficiency of new and existing coal power plants represent an alternative to carbon capture and storage technologies for CO_2 reduction. These improvements also have the potential to lower operating costs, reduce plant emissions, and help trim water use.

Jeff Phillips is the programme manager for EPRI's CoalFleet for Tomorrow programme. Sam Korellis is a senior project manager in EPRI's Combustion Performance and NOx Control programme.

Magnitudes of potential heat rate improvement from various options considered for new combustion-based coal power plants



Going big offshore

The growing offshore wind power market is seeing manufacturers introduce the next wave of turbines with outputs of 6 MW and higher.

Junior Isles

In preparation for the predicted offshore market boom, a number of equipment manufacturers have recently announced the next generation of wind turbines – large machines of 6 MW and above specifically designed to operate in the harsh conditions experienced offshore, especially in northern Europe.

In the last few months, Alstom, Nordex and Vestas revealed details of turbines aimed at the offshore wind market. Siemens also said it plans to announce its large offshore offering by the end of this year.

A key driver behind the timing of the announcements is the UK Round 3 offshore wind programme, which could generate up to 32 GW of power from nine wind farm zones. Proposals for the wind farms are in the pre-application phase for consenting, with construction expected to begin around 2014/15 at the earliest.

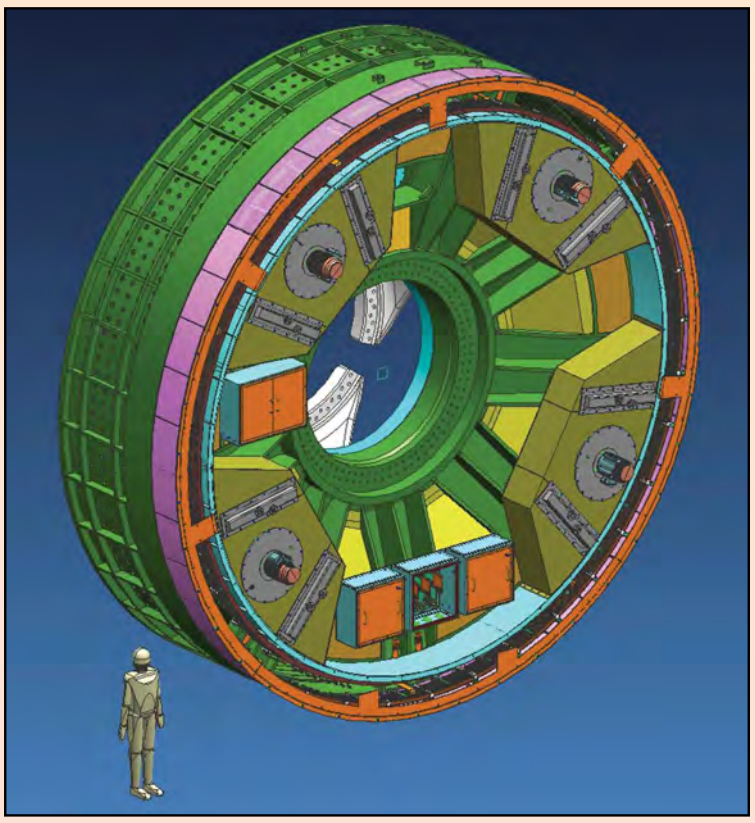
Speaking at a Roundtable meeting in London at the end of March, Alfonso Faubel, Vice President of Alstom Wind said: "We will be targeting the third round of the Crown Estate… and will have a commercially releasable version of our new offshore wind turbine by 2014, which, not by coincidence, is when the third round of the Crown Estate and the French tender will come in place."

Alstom has not yet revealed the full details of its 6 MW offshore turbine. With the length of the turbine blades yet to be announced, the unit is being called the ECO 1XX (where 1XXm will be the rotor diameter in metres). When announced in March, the company said that the turbine "would boast the world's longest blades".

Alstom will not disclose the specific rotor diameter of the turbine until later this year but says it will be very large in order to maximise yield so as to reduce the relative cost of infrastructure (foundations, grid connection), traditionally very high offshore.

The blades, which are being developed in collaboration with Danish blade manufacturer LM Wind Power, are a key feature of the turbine. LM is currently working on the first blades for the prototype in Denmark and some aerodynamic testing has been done on mock-ups.

Faubel noted: "The size of the blades are one of the contributors to the three key features of our offshore wind turbine. We have a completely new design that is characterised by being robust, simple and efficient."



Alstom's 6 MW turbine features an "advanced high density" direct drive permanent magnet generator developed in collaboration with Converteam. It is claimed to be the world's largest for offshore windpower

The ECO 1XX's robustness is mainly attributed to Alstom's Pure Torque technology, which according to the company lies at the heart of its development. Pure Torque essentially allows any bending moments to be deflected away from the mechanical components of the turbine to the structure, allowing purely the torque to the direct drive generator. Deflecting the heavy bending loads experienced at sea towards the turbine tower serves to protect the mechanical components. According to Alstom, it means the mechanical components can be made lighter, generating more energy with less weight.

The turbine also features an "advanced high density" direct drive permanent magnet generator (PMG). Developed in collaboration with Converteam, the PMG is claimed to be the world's largest direct drive PMG for offshore windpower. It is said to be more compact and lightweight compared to earlier generation direct drive systems. According to Alstom, using a direct drive makes for a simpler design, resulting in about 40 fewer rotating components than a geared machine. This, it believes, will improve reliability and lower maintenance costs.

Alstom plans to start testing an onshore prototype during the coming winter, and an offshore prototype mid-2012. For the offshore unit, it will collaborate with Belgian wind farm developer Belwind with a view to demonstrating the turbine as part of a demonstrator project in Belgium of approximately 40 MW.

The project would be developed over the period 2012-2015 at Phase 2 of the Belwind wind farm located on the Bligh Bank on the Belgian continental shelf, near the Belgian port of Zeebrugge. Type certificate is expected in the first half of 2013.

Like Alstom, Nordex is also launching a 6 MW direct drive turbine. Specially developed for offshore use, the N150/6000 will have a rotor diameter of 150 m and use a direct drive with a PMG and a full power converter to reduce head mass. The rotor blades will, in some structural parts, include carbon to further reduce weight.

Despite the large rotor, Nordex says the top-head mass is 30 per cent lower compared to conventional, geared 5 MW and 6 MW offshore turbines/prototypes currently in the market. The turbine is expected to have a weight-to-power ratio of approximately 55 t/MW, resulting in a total weight of 330 t in total (+/- 10t).

Having a lighter machine, says Nordex, reduces installation costs and loads for the whole system, leading to longer lifetime and fewer service interruptions.

Nordex CEO, Thomas Richterich said: "Our drive train concept leads to a lower top-head mass. Lower top-head mass means that the whole structure (mainframe, tower, foundation) can be lighter. This results in less steel in the structure, lower material costs and so lower capital cost."

Nordex anticipates that operational expenditure will be significantly lower compared to today's offshore turbines. The thinking is that less moving components results in fewer repairs. As there is no gearbox, there will be no need for oil exchange, gearbox inspection etc, resulting in lower maintenance costs.

Nordex believes that the decision to eliminate the gearbox makes overall economic sense in an offshore environment.

It points out that the relative cost of direct drive, in relation to the wind farm project, for an onshore turbine installation

Giant offshore turbines are being developed in time for the UK Round 3 offshore programme

is about 65 per cent. This compares to about 25 per cent for an offshore turbine installation.

"This makes the more expensive direct drive concept commercially viable offshore. And it pays out Nordex because maintenance at offshore sites is not easily done. Due to the more difficult accessibility, offshore maintenance has to be reduced to a minimum. Less moving parts in a direct drive ultimately means less maintenance and reduced downtime," said Richterich

Nordex is engineering this direct drive design in conjunction with experienced suppliers and thus relying on proven technical details. Only system suppliers able to deliver the entire generator/converter system and who are market leaders in this area are being considered, says the company.

Plans for commercialisation will also coincide with UK Round 3. A prototype phase with intensive testing will take place in 2012/13 before series production begins in 2014/2015 in time for execution of the first large-scale project in 2015.

Richterich said: "The UK Round 3 sites, scheduled to start in 2015, are definitely among the core markets targeted with the N150. Our turbine will be in the market at that time."

Although Siemens is yet to announce its plans, it is also targeting UK R3. Henrik Stiesdal, Chief Technology Officer at Siemens Wind Power said: "Before long we will install the prototype of our next wind turbine. It will be a 6 MW machine and the prototype will be installed at an onshore location in Denmark. It is our philosophy not to disclose any details before the prototype will actually be installed. As for the production location, our planned assembly facilities are designed with this machine in mind and it is expected that 6 MW wind turbines for the UK Round 3 will be assembled in the UK."

Unlike Alstom, Nordex and Siemens, Vestas is launching a slightly bigger machine. Its V164 has a rated power output of 7 MW and a rotor diameter of 164 m. Interestingly, it has opted for a turbine design that uses a gearbox.

According to Vestas, when it started looking at developing the turbine, 6 MW was "the working title". However, it realised that the power output could be increased using available proven technology, while remaining within the acceptable risk envelope.

Anders Søe-Jensen, President of Vestas Offshore explained: "When you go really big and enter into unproven territory, your risk profile increases as does your cost. When we looked at the proven technology that is available and mature, and looked at its cost compared to the cost of energy that could be delivered, we found that the sweet spot happened to be 7 MW."

Reliability and cost of energy are the two main considerations in the design of offshore wind turbines. However, Vestas has not come to the same conclusions as Alstom and Nordex in terms of the drive technology best suited to achieve these goals.

At the outset, it assessed both geared and direct drive technology and concluded that the complexity of direct drives in terms of electrical components could make for a less reliable system. Vestas will therefore use a medium-speed gearbox, which it says has proven reliability.

Søe-Jensen said: "We have experience with direct drives and know that multiplying the number of electrical components, multiplies the number of faults. In turbines it has been proven that the majority of downtime is caused by electrical components, not mechanical components. With our geared solutions, the lost production factor (LPF), i.e. the time you are not producing power when the wind is blowing, is below 3 per cent. So this is proven technology. Also we have removed the high-speed part of the gearbox, which is the root cause of most mechanical faults. We can prove our availability and LPF on a geared solution; direct driven is still unproven technology."

The low LPF and high availability, according to Vestas, will bring down the cost of energy by 30-40 per cent from current offshore levels, something that Søe-Jensen sees as all important. "Cost of energy is the only thing that should be interesting for the utilities, politicians and society, not capex or opex," he stressed.

While the UK R3 is a core target for the turbine, interestingly, Vestas says it will only go into production if there is a firm order backlog. This is a departure from the company's normal approach.

Søe-Jensen explained: "All the turbines currently in the market can work on and offshore – usually constructed for onshore and then marinised for offshore. Our turbine will need a production line of its own. We want to be sure there is a long term, stable and transparent framework that ensures utilities can make their investment plans before we make the multi-million investment that is needed to bring the turbine to the market."

With the UK going through its Electricity Market Reform this brings a level of uncertainty to production. "We can only hope and pray that the UK gets a new system implemented as soon as possible," commented Søe-Jensen.

With the UK being a core market for the new generation of large offshore turbines, no doubt all the wind turbine manufacturers are saying a similar prayer.

Junior Isles

A perfect storm for wind

If ever there was a time for wind and indeed other renewables such as solar and biomass to take centre-stage, it is now. The unfortunate disaster at the Fukushima Daiichi nuclear power plant and the ongoing turmoil in a number of Arab countries has created a perfect storm – a rare set of coincidental events that should remove any doubts within governments around the world about the need to increase their commitments to renewables.

Although it is safe to say that wind in particular has made tremendous strides over the last decade, arguably the debate about the ultimate potential of renewable energy is continuing to keep its share in the generating mix at a less than modest level.

A recent report from the International Energy Agency says that that while impressive progress has been made in developing clean energy technologies in recent years, the success stories are being overshadowed by surging demand for fossil fuels, which are outstripping deployment of clean energy technologies. Coal has met nearly half of the global new electricity demand over the past decade.

In fairness, much of the demand for fossil fuels has come from China and India. And although China intends to reduce the share of coal in its generating mix, under its latest Five Year Plan natural gas will replace coal to the largest extent. Gas will increase from 4 to 8 per cent of the energy mix.

China's finalised targets for nuclear, hydro, wind and solar are expected to be published in the coming months and it will be interesting to see how the targets for renewables are revised.

The Japanese crisis has seen the country put new nuclear projects on hold pending a re-assessment of safety systems. While China has reiterated its commitment to nuclear, pressure to cut CO_2 emissions will likely see any scaling back in nuclear result in an increase in renewables targets. Indeed it has already said it will double its target for solar.

Environmentalists and proponents of renewables have been quick to point out what the current woes of nuclear power could and should mean for renewables.

At a UN meeting of climate change negotiators in Bangkok in early April, Tove Maria Ryding of the environmental group Greenpeace said: "It's a false choice to give the public an alternative between a climate change disaster or a nuclear disaster. We need renewable energy. Now, we can either have a kick back or a leap forward."

Out of all renewable sources, wind has made the most progress in the last decade or so. Commenting on Europe, Christine Lins, Secretary General of the European Renewable Energy Council said: "The 1997 Renewables White Paper set out objectives for 2010. For wind, the objective was 40 GW. This was reached in 2005 and we ended up with 85 GW in 2010."

According to the recently launched *World Wind Energy Report 2010*, by the World Wind Energy Association (WWEA), worldwide wind capacity reached 197 GW. The report, however, stated that there have been signs of the market slowing down, noting that wind power showed a growth rate of 23.6 per cent in 2010 – the lowest since 2004 and the second lowest level of growth in the past decade.

> … total global generating capacity for renewable energy sources outstripped nuclear energy for the first time in 2010

The report said that major decreases in new installations were observed in North America, with the US losing its number one position in total generating capacity to China.

China added 18 928 MW within one year, accounting for more than 50 per cent of the world market for new wind turbines. But although China has been installing wind turbines faster than any other country and is now number one in terms of wind capacity, actual wind power generation is still limited by underdeveloped ultra-high voltage transmission lines.

The WWEA report also said that many Western European countries are showing stagnation. It said that the decrease in new capacity outside China is the result of insufficient political support. "In a paradox situation," it stated, "more and more policymakers are declaring their support for increased use of wind energy, but such statements do not go hand in hand with the necessary political decisions."

If governments want wind to play a greater role than was previously planned and in a shorter timeframe, they will have to implement stable and reliable policies as well as get a grip on the transmission system infrastructure.

This is certainly the situation in the UK, which is the biggest offshore wind market. The developments here are significant since, globally, offshore wind represents the highest growth area. Total installed offshore wind capacity amounts to 3117. 6 MW, of which 1161.7 MW was added in 2010 according to the WWEA. This represents a growth rate of 59 per cent. The UK accounted for more than half of the offshore market in 2010.

With an offshore potential of 32 GW from Round 3 of its offshore programme, many are eagerly awaiting details on the government's Electricity Market Reform. To fulfill its ambitions, the UK, like any government, will need a framework that supports long-term investment. Speaking at a recent media roundtable on offshore wind, Joan MacNaughton, senior vice president of Alstom Wind, said: "We want to see something that gives investors confidence in the overall coherence of the regime given the timescale of projects."

At the same time, for Europe to really benefit from its extensive offshore wind resources, there will have to be firm commitment and continued development on building what is being called a supergrid. Such a grid of HVDC links across Europe would link renewable energy generation across the North Sea, including wind power from the UK, solar power in Germany and hydropower in Scandinavia, maximising the use of renewable energy.

Progress in policy and massive investment in grid infrastructure will be crucial if renewables are to replace nuclear and ultimately fossil fired generation – a scenario that some see as entirely possible. In fact some are already sounding the death knell for nuclear and heralding the new age of renewables.

According to a new report, *The World Nuclear Industry Status Report 2010-2011*, from the Worldwatch Institute, total global generating capacity for renewable energy sources outstripped nuclear energy for the first time in 2010. It said that worldwide installed capacity of wind turbines, biomass and waste-to-energy plants, and solar power reached 381 GW, compared to the installed nuclear capacity of 375 GW.

Nevertheless, sustaining or even increasing the rate of progress to the levels that renewable backers say are possible will take a fundamental change of the entire electricity system.

The Worldwatch Institute's report stated that the nuclear industry "was arguably on life support before Fukushima and that "when the history of the nuclear industry is written, Fukushima is likely to begin its final chapter". Considering the point at which we are, and the changes that are needed, perhaps that statement is a trifle Hollywood.

Although the likely increased capital costs and insurability of projects may well result in another prolonged nuclear hiatus, the world is unlikely to be permanently put off from building nuclear plants. The overall benefits and fundamental need to pursue and perfect technology will be the overriding drivers, ultimately seeing it regain any lost momentum at some point in time.

Nevertheless, this perfect storm may well bring a fundamental shift in the future energy landscape. Whether nuclear is "on life support or not", the Fukushima disaster has certainly thrown out a lifeline to wind, if indeed it ever really needed one.