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# Nuclear U-turn will increase reliance on gas



About-turn: Merkel faces "a big challenge"

Decisions by Germany and Switzerland to close their nuclear power plants will increase Europe's dependence on gas, says **Junior Isles**

Recent decisions by Germany and Switzerland to abandon nuclear power will most likely result in Europe becoming even more reliant on natural gas.

In late May the Swiss cabinet voted to decommission its five nuclear reactors. The move was followed a week later by Germany, which has now said it will close all of its 17 nuclear power plants by 2022. Italy has also decided to shelve plans to re-launch nuclear power following

the accident at Fukushima in Japan.

Swiss Energy Minister Doris Leuthard said that the government has not yet fixed a date for final phase-out of its nuclear reactors, but it is generally expected that they would be phased out as they reach the end of their design life. This would mean that the last reactor would cease operation in 2040. Nuclear provides about 40 per cent of Switzerland's electricity. Germany's decision represents a

policy U-turn for the coalition government. Chancellor Angela Merkel had previously decided to reverse the previous government's decision to close the country's nuclear plants early, thereby allowing them to continue operating for an additional 14 years to 2036.

Ms Merkel, who described the U-turn as a "big challenge", has now committed Europe's largest economy to doubling the amount of electricity from renewables to 35 per cent this decade.

"We have the chance of becoming the first big industrial nation to make the switch to renewable energy," she said.

However the cost of such a switch is a serious concern. Ronan O'Regan, Director of energy and utilities at PricewaterhouseCoopers (PwC), estimated that Germany could expect to spend €3 billion (\$4.3 billion) for every 1000 MW of new offshore wind capacity. An

*Continued on page 2*

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*(Continued from page 1)*

equivalent gas fired power plant would cost about €800 million.

Until March – before seven reactors were taken offline in the immediate aftermath of Fukushima – just under a quarter of Germany's electricity was produced by nuclear power.

Gas accounts for 23 per cent of the EU's power generation compared with 28 per cent for nuclear and 19 per cent for renewables such as hydro, wind and solar.

However, even if there is a boom in renewables to take up the slack from the closing of nuclear plants, gas is still likely to benefit because of the need for back-up generation to accommodate the variability of wind and solar.

Gunther Oettinger, Europe's Energy Commissioner commented: "After Berlin's decision, gas will be a driver of growth. More renewables means more gas volumes too."

Gas is relatively abundant and cleaner than coal. This has led to Brussels backing plans to build the Nabucco gas pipeline to bring gas from Azerbaijan to Europe in order to reduce Europe's dependence on Russian gas. The decisions to close nuclear plants in Europe will provide momentum to talks to build the pipeline. A decision on whether to go ahead with the plan is due later this year or next year.

Poland and other European countries are also increasing their efforts to utilise shale gas trapped in rock formations in spite of environmental concerns.

The German government's policy reversal has come under fire from industry. The Federation of German Industries said the government must not allow the policy changes to lead to an unstable power supply or rising electricity prices, both of which would affect the country's competitiveness. The organisation said it was "certain" that electricity prices would rise.

"Transforming the energy sector is a hugely demanding project," said Hans-Peter Keitel, the president of the Federation of German Industries.

He urged the government not to set the nuclear exit date of 2022 in stone, but to agree on a date that would be adjustable if problems arise in the coming years.

Sweden's Environment Minister Andreas Carlgren also said that focusing on a fixed end date was unfortunate.

"That means you risk missing the essential part, that is how we should manage the double challenge of reducing the dependence on nuclear power and on climate emissions," he told Swedish news agency TT.

Germany's biggest power companies have not yet commented on the decision, saying they are waiting for more detail in the course of legislation – due to be completed in July.

In a further blow to the utilities, the government also said it would not abolish a nuclear fuel-rod tax, arguing the tax bill would fall from €2.3 billion to €1.3 billion as plants closed this year.

# UK reforms will not deliver low carbon investment

As the UK released its fourth carbon budget, a report by the Climate Change Committee says that current plans to reform the electricity market will not bring the low carbon investment needed. **Junior Isles**

A new UK policy framework designed to encourage companies to invest some £110 billion (\$176 billion) in low carbon forms of electricity generation have been branded as "over complex" and will fail to raise the necessary capital.

The government is proposing a new tariff system designed to reward low carbon generation but a report by the Climate Change Committee (CCC) says current proposals will favour new nuclear stations and biomass plants.

The government's 'one-size-fits-all' approach will fail to bring forward the low-carbon investment we need. The model of contracts proposed may be appropriate for some generators, such as nuclear and biomass, but could increase costs and risks for intermittent generators such as wind and technologies like carbon capture and storage and electricity storage," the report read.

The report argued that, "alternative kinds of long-term contracts should be designed for other kinds of low-carbon generation". It further encouraged the government to, "create an independent expert institution to design these

contracts as soon as possible".

The Department of Energy and Climate Change responded: "The government's position that there will be no specific subsidy for nuclear is absolutely clear. Electricity market reform will provide support to all forms of low-carbon generation, not just nuclear, and that will enable the shift to a low carbon economy."

The CCC also noted that the wholesale energy market should be opened up, and barriers to entry reduced. The proposed reforms, they said, were unfortunately not suited to producing this kind of contestability or threaten the oligopoly of the UK's 'Big Six' utility giants. They also warned that these companies would be unlikely to provide the investment the country would need to replace ageing power plants and cut carbon emissions over the next decade.

The UK government is proposing an ambitious and legally binding carbon target which could pave the way for emission reductions of "at least" 80 per cent by 2050, and will continue to push the EU to set even tougher

emission targets.

The UK's fourth carbon budget, released last month, commits to restricting total emissions between 2023 and 2027 to 1950 million tonnes of carbon dioxide equivalent, equal to a 50 per cent emissions reduction by 2025 on 1990 levels.

Energy Secretary Chris Huhne said the targets could be met through a ramp up in clean energy, electric vehicles, electricity market reform and initiatives such as the Green Investment Bank. However, the door was kept open to trading as a way of meeting the targets.

The government added that it would maintain pressure on the EU to move to a 30 per cent target for 2020, and take "ambitious action in the 2020s". It also plans to "revise up" its carbon budget if, by 2014, the UK's emissions trajectory falls short of that of the EU.

Oliver Rix, Director, Redpoint Energy commented: "The government has set itself – and indeed its successors – a very challenging goal. The CCC's analysis, in common with others, shows the need for significant progress



**Chris Huhne:** calling for deeper cuts

in the buildings sector but is heavily reliant on power generation decarbonisation. The CCC's own ambition here has increased significantly in the last 12 months (from 100 g CO<sub>2</sub>/kWh to less than 50 g CO<sub>2</sub>/kWh by 2030). Achieving this is critically dependent on clarity from the government on its Electricity Market Reform proposals, in order to provide a clear framework for investors. We would note that the concept of a 2014 review for the traded sector introduces an element of uncertainty by implying that the UK's commitment is linked to the pace of overall EU decarbonisation."

Commenting on the CCC's call for the government to ease back on its 2020 offshore wind energy targets, Maria McCaffery, RenewableUK's chief executive said: "The current 2020 target for offshore wind is already below what the industry can deliver. Back-tracking on the target even further makes no sense: the UK's world leading offshore sector needs confidence, not doubt and prevarication."

## Low carbon projects vie for EU funding

EU member states have put forward 78 large-scale renewable energy and carbon capture and storage (CCS) projects to compete for funding to be allocated under the EU's NER300 programme.

The NER 300 programme will be funded by the sale of 300 million carbon allowances from the EU emissions trading system (ETS) New Entrants Reserve (NER) – a quantity of allowances set aside for newly built installations. The allowances are worth about €5 billion (\$7 billion) at the current carbon price and the European

Commission expects the scheme to leverage around the same amount from private sources.

According to an initial screening of the projects by the European Investment Bank (EIB), applications for 13 CCS projects and 65 projects involving innovative renewable energy technologies have been submitted.

The EIB has begun its financial and technical assessments of the applications, which it aims to conclude by February 2012. The Commission will then present the bank's recommendations to the EU climate change committee, on which all member states are represented, before announcing the final list of chosen projects in the second half of next year.

At least one project and up to a maximum of three will be funded per member state.

The UK government has submitted 12 applications – seven CCS and five renewables projects – for consideration by the EIB. The renewables proposals are focused mainly on harnessing wave and tidal power off the coast of Scotland.

Among the applicants, Drax in Yorkshire hopes to build an oxyfuel power plant and store carbon under the North Sea. Another project being proposed by the UK is a collaborative project bringing together three of Europe's leading utilities and wave energy technologies provided by Aquamarine Power and Pelamis.

Known as the Pentland Orkney Wave Energy Resource (POWER) project, the aim is to deliver the world's first large scale, grid connected demonstration of a wave energy farm with a total generation capacity of 28 MW.

Chris Bronsdon, Chief Executive of SEGEC said: "While still in the early stages of the bid process, it is very exciting to see that the POWER project has progressed through to this next stage. This project represents an innovative and collaborative approach from the outset that will realise not only knowledge sharing and learning but will be a crucial step in the delivery of technology learning for commercial-scale wave energy."

## CCS makes headway

In a joint R&D project, Metso and Fortum have completed trials of oxyfuel combustion technology for circulating fluidised bed boilers (CFB). CFBs can be operated with a wide range of fuel types, such as coal, biomass and a mixture of fuels.

In 2010, Metso's 4 MW test plant in Tampere, Finland, was modified for oxyfuel combustion.

The pilot has come to an end and the results of the project will be evaluated during 2011.

Jussi Mäntyniemi, General Manager, Technology at Metso's Power business line said: "We have carried out a comprehensive series of tests ranging from laboratory measurements to continuous pilot-

scale tests. In the pilot-scale testing, we focused on developing both the actual boiler process and safe operation of the boiler plant during oxyfuel combustion. Modifying Metso's 4-MW test plant for oxyfuel combustion has been challenging and we are pleased with what we have achieved. With circulating fluidised bed technology, coal and biomass can be co-fired, thereby turning the power plant into a carbon sink."

Marja Englund, manager of the project at Fortum commented: "By altering Metso's test equipment for oxyfuel combustion, we have received a lot of new information in terms of the future opportunities that the technology offers. The tests provide

both empirical data and new information concerning the operation of the plant."

Meanwhile, Alstom Power announced the successful operation of a chilled ammonia CCS validation project at American Electric Power's (AEP) Mountaineer Plant in New Haven, WV, USA.

The project, the world's first facility to both capture and store CO<sub>2</sub> from a coal-fired power plant, represents a successful scale-up of ten times the size of previous field pilots projects.

According to Alstom the facility achieved: capture rates from 75 per cent (design value) to as high as 90 per cent; CO<sub>2</sub> purity of greater than 99 per cent; and energy penalties

within a few per cent of predictions from Alstom's process simulation model.

AEP's Mountaineer plant is a 1300 MWe coal-fired unit that was retrofitted in 2009 with Alstom's patented chilled ammonia CO<sub>2</sub> capture technology on a 20 MWe slipstream of the plant's flue gas.

In Canada the Saskatchewan government has approved construction of the C\$1.24 billion (\$1.3 billion) Boundary Dam CCS project near the town of Estevan. The project will upgrade one of the six coal-fired units at the 842 MW power station. Construction will begin immediately with the project becoming operational in 2014.

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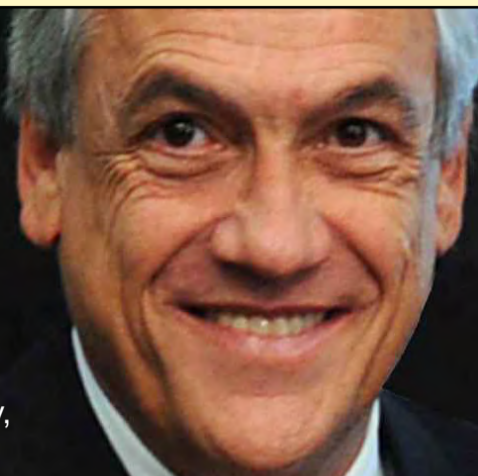
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# Chile clears HydroAysén project

A proposed large hydropower project in Chile's southern wilderness will give the country's energy resources a much needed boost, but the environmental cost of the project is too high a price to pay, say opponents.

Sebastian Piñera:  
Chilean president



## Sián Crampsie

Chilean president Sebastian Piñera has defended his government's energy policy amid widespread protests against proposed hydropower and coal fired projects.

In his annual state of the union address, Piñera reiterated the need for Chile to continue increasing its electricity generating capacity in order to sustain economic growth, and said that the government needs to make decisions now in order to avert an energy crisis later on in the decade.

The Chilean government last month issued an environmental permit for the HidroAysén hydropower project, which would increase the generating capacity

of the country's main SIC grid by 35 per cent. The decision sparked widespread protests – some of them violent – around the country by environmentalists who are concerned about the impact of the project, which is located in a pristine and remote part of the country.

In May Chile's Energy and Mining Minister Laurence Golborne announced the creation of a presidential commission to establish a long term energy policy for the country, which imports 97 per cent of its fossil fuels and depends largely on hydropower for electricity.

In his speech, Piñera acknowledged the fierce public debate triggered by the HidroAysén project and said that the government would promote "a deep and

responsible debate, to agree on policy". He reaffirmed the government's commitment of promoting non-conventional renewable energy sources, but said that "to say that the solution to our problem lies in these [renewable] energy sources, is a utopia", and that consequently, "we cannot renounce thermal or hydro electricity".

The \$7 billion HidroAysén project is owned by Endesa and Colbun, who are proposing to build five hydropower plants on the Baker and Pascua Rivers as well as a 2000 km transmission line that will export the plant's energy to Santiago. Chile relies heavily on energy imports and the project would have a significant impact on energy security.

Opponents say that the 2750 MW project will flood nearly 6000 hectares of land, decimate the already dwindling population of South Andean deer and endanger fish stocks. According to analysts IHS CERA, demonstrations against the project took place in 27 locations across the country, with around 40 000 people gathering in the capital Santiago.

"We are outraged that the regional environmental review commission has approved this destructive and illegal project against the will of the majority of Chileans," said Patricio Rodrigo, Executive Secretary of the Counsel in Defense of Patagonia. "We are calling on President Piñera to overturn this decision

and protect Patagonia."

According to campaign group International Rivers, the project's transmission line will require the world's longest clearcut through virgin rainforest, protected areas, national parks, and a geologically risky region strewn with active volcanoes and afflicted by earthquakes.

Chile's reliance on hydropower and energy imports leads to crises when droughts drain reservoirs or far away disputes affect energy imports. Piñera has ruled out the construction of nuclear power plants under the current government, but has indicated that it will continue assessing the feasibility of the technology for Chile.

# Utilities consider EPA rule impacts

■ Reliability concerns voiced ■ EIA points to strong future for coal

Utilities and regulators in the USA are concerned about the potential impact of the Environmental Protection Agency's (EPA's) new regulations.

The new rules aim to cut certain pollutants from power plants by up to 91 per cent by 2015 in order to improve the environment and reduce healthcare costs in the country.

However they will require energy companies to install costly equipment for their plants, or shut them down. While some utilities may benefit from the stricter rules because they operate low-emissions power plants such as

nuclear or renewables, others are facing high costs and difficult decisions.

The EPA is revising rules on air pollution, mercury emissions and the handling of coal ash waste. The rules also aim to minimise impacts on fish that live in reservoirs used to cool plants.

Utilities such as American Electric Power, Southern Co. and Duke Energy are asking for more time to implement the rules and say they are concerned that a surge in plant shutdowns will create reliability problems.

In May the Electric Reliability

Council of Texas (ERCOT) released a study showing that the new EPA rules could cause operators of older natural gas-fired plants to shut them down and that shutdowns could reduce Texas' reserve capacity to two per cent in 2015 if no replacement plants are built.

Power prices are currently too low to drive investment in new plant, says ERCOT, whose target reserve capacity is 13.75 per cent.

Some analysts believe that the new regulations will help to drive the recovery in the USA's power market

by cutting supply to match demand more closely.

AEP estimates that EPA regulations would cost it between \$5 billion and \$11.2 billion depending on the timeline and the scope of the rules that are implemented. These costs would be passed on to AEP's utility customers in the form of higher rates.

Not every coal-power generator will feel the heat from higher costs, though. The EPA rules target those generators that use sulphur-rich Appalachian coal.

In addition, a recent report from the US Energy Information Administration

said that electricity generation from coal will increase by 25 per cent from 2009 to 2035, and that coal will generate 43 per cent of the country's electricity in 2035.

"This report underscores the important role that coal will play long into the future," said Steve Miller, president and CEO of the American Coalition for Clean Coal Electricity. "Coal will continue to be America's fuel for decades to come because it will remain affordable, reliable and will be used in an increasingly clean manner."



# US urged to act on GHGs

The US government is facing further criticism over its inability to impose legislation to combat global warming.

The United Nations (UN) has expressed concern that Washington's inaction on climate change may harm climate negotiations scheduled for South Africa later this year, while a 22-member expert panel in the USA has said that climate change is one of the most important challenges facing the country today.

UN climate chief Christina Figueres said in May that although she believes that the US will eventually join the

rest of the industrialised world in mandatory reductions of greenhouse gases (GHGs), its failure to implement legislation is a threat to world efforts to combat global warming.

The National Research Council in the USA has issued a report in which it urges the government to act to reduce greenhouse gas emissions. The USA's stance on international mandates to combat climate change have been a major sticking point in global negotiations.

In its report, the Council notes that the US lacks a coordinated national

Christina Figueres:  
US is threatening  
global GHG  
reduction efforts



response to climate change and that the impacts of climate change on human and natural systems can generally be expected to intensify with warming.

Resistance to climate change legislation is strong in the US, with resistance coming mainly from Republicans. They are concerned about

the impact of legislation on the country's coal, oil and gas industries, as well as on energy prices.

Last month the UN said that renewables such as solar and wind could supply up to 80 per cent of the world's energy needs by 2050 but that some \$12 000 billion would have to be invested to meet this target.

## LA ready for fuel cell vehicles

The opening of the first hydrogen fuelling station in the USA fed directly from an active industrial hydrogen pipeline has been labelled a "critical step" in the market launch of fuel cell vehicles.

Toyota Motor Sales (TMS) together with Air Products, Shell, South Coast Air Quality Management District (SCAQMD) and the Department of Energy (DOE) have collaborated to implement the facility, which will provide hydrogen for the Toyota fuel cell hybrid demonstration programme vehicles as well as other manufacturers' fuel cell vehicle fleets in Los Angeles.

TMS is planning to bring a fuel cell vehicle to market in 2015 and is planning to expand the infrastructure needed in order to support its customers.

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# Japan reviews electricity strategy



Starting from scratch:  
Prime Minister  
Naoto Kan

Japan is considering reforming its power sector and increasing the use of renewables and energy conservation following the nuclear disaster at Fukushima, says **Junior Isles**

Japan is considering changes to both the structure of its electricity sector and its future energy mix following the disaster at the Fukushima Daiichi nuclear power plant.

Prime Minister Naoto Kan said that the government would discuss the separation of electricity generation and transmission as part of a structural review of power companies.

"A time will come for discussion [on what power companies are responsible for], including reviewing the current system in which certain companies have a regional monopoly on electricity," Kan said at a press conference at the Prime Minister's Office.

"When we consider the country's basic energy plan, we'll discuss issues

such as the separation of power generation and transmission. We should do that," he said.

The prime minister also said the government would fundamentally review nuclear energy administration. He said the government would discuss a plan to separate the Nuclear and Industrial Safety Agency, in charge of nuclear safety regulations, from the Economy, Trade and Industry Ministry, which promotes nuclear energy.

While it is likely that nuclear will play a smaller role in the future energy mix, there are no plans to completely abandon nuclear any time soon. The country is already facing the possibility of a summer power shortage of about 10 GW.

Concerning nuclear power plants that

have suspended operations for regular inspections, Kan clarified the government will allow those plants to continue running. "The government will approve plants to operate if emergency safety measures are adhered to and the plants' safety is confirmed," he said.

However in the longer term, Kan said the government must give up plans under its 2010 energy policy in which nuclear power would account for half of the nation's generating capacity needs by 2030, compared with about 30 per cent now. Around 14 extra reactors would have been built.

"We will need to revise our energy policy from scratch," said Kan. The country will instead put a greater focus on renewables and energy

conservation. Kan said Japan will have to compile its new energy policy in a report for submission to the International Atomic Energy Agency this month (June).

Kan said that nuclear and fossil fuel used to be the pillars of Japanese energy policy but now the government will add two more pillars: renewable energy such as solar, wind and biomass, and an increased focus on conservation.

"We will thoroughly ensure safety for nuclear power generation and make efforts to further promote renewable energy," an area where Japan has lagged, he said.

According to HSBC Global Research, to completely make up the future shortfall in nuclear capacity with renewables, Japan would have to install

about 70 GW of mostly wind and solar.

In a research note last month, HSBC set out the implications of two scenarios: under the first, the extra nuclear capacity is entirely replaced by renewables, while under the second the gap is closed 50 per cent by renewables and 50 per cent through energy efficiency measures.

Japan would have to increase the rate it is installing renewable power capacity by around two or three times the capacity HSBC predicts will go online this year, or an extra 1.75-3.5 GW a year.

"This is just a fraction of the country's more than 1500 GW of wind and solar potential," HSBC said, citing a 2010 report by Japan's environment ministry.

## Tepco revises plan to cool Fukushima reactors

■ Reactor flooding method abandoned  
■ Tepco president resigns

In the face of more problems at the Fukushima No. 1 nuclear power plant than it originally thought, Tokyo Electric Power Company (Tepco), has revised its road map for bringing the crisis under control. The company's President Masataka Shimizu also announced his resignation after reporting huge financial losses.

In a major change from the first plan released in April, Tepco will be using a massive amount of irradiated water flooding the basements of the turbine buildings for reactors 1, 2 and 3 as a main circulating coolant.

The original plan called for flooding the containment vessels to cool the reactor cores, but the level of the water in the Unit 1 containment vessel does not appear to be increasing

despite an injection of more than 10 000 tons of water.

Because the containment vessels of reactors 2 and 3 are also possibly damaged, Tepco has given up on the flooding method for now, although it may do it again if the utility can find and plug cracks and holes in their containment vessels.

Tepco says it will still stick to its timeframe of aiming to achieve a cold shutdown of reactors 1, 2 and 3 and bring the temperature of the reactor-core coolants below 100°C in five to eight months.

However, doubts are growing about the utility's promise to bring the plant under control in the predicted timeframe.

"This is a very difficult task," said Mamoru Katou, an energy analyst at

Tokai Tokyo Research. "No one really knows."

Meanwhile Mr Shimizu, criticised for his low profile during the disaster's early days, is stepping down to take responsibility for the ongoing crisis.

"I am resigning for having shattered public trust about nuclear power, and for having caused so many problems and fears for the people," Shimizu told reporters, bowing in a traditional Japanese apology during a news conference. "I wanted to take managerial responsibility and bring a symbolic close," he said.

Tepco reported that its losses for the fiscal year ended March 2011 totalled Yen1.25 trillion (\$15 billion) – one of the biggest annual financial losses ever in Japan's corporate

history. Tepco had a profit of nearly Yen134 billion the previous fiscal year.

Moody's has warned it could further downgrade its debt rating for Tepco to junk bond status if commercial banks refuse to extend the utility more credit. In May, Moody's lowered its rating by two notches to a level just above junk status.

Meanwhile, the government is to set up a fund to help pay for damages stemming from the crisis at the plant, financed by public money and mandatory contributions from utility companies.

The government's plan, which would spread the burden for the crisis and must be referred to parliament for its expected approval, would create an entity that collects money

for compensation from Tepco and other utilities that operate nuclear power plants. The government will issue the body special bonds that can be cashed when needed to pay claims.

Last month Tepco agreed to a cost-cutting reorganisation, intended to ensure its ability to pay compensation and create a commission to monitor the company's management.

Tepco has sought a Yen2 trillion (\$24.8 billion) loan to get it through the initial emergency period. It expects to pay Yen50 billion in initial compensation to nearly 80 000 residents evacuated from around the plant.

The Tepco board of directors promised to take no pay, and other executives will return 40 to 60 per cent of their salary, the company said.

## China to boost offshore wind power

China will expand its offshore wind power installed capacity to 5 GW by 2015 and 30 GW by 2020, according to the Chinese Renewable Energy Industries Association (CREIA).

China, the world's largest wind power developer with a total of 44.7 GW installed wind capacity at the end of 2010, has accelerated the development of offshore wind power in recent years.

According to Qin Haiyan, secretary general of the China Wind Energy Association (CWEA), offshore wind development remains in the early stages due to the complex operating environment for offshore turbines, high technological requirements and construction difficulties.

In 2009, China had only 63 MW of offshore wind capacity. However, 2010 marked the start of the country's

offshore wind power sector's transition from research and pilot projects to operational wind farms.

In March 2010, Shi Lishan, deputy director of the New Energy and Renewable Energy Department of the National Energy Bureau (NEB), said top priority would be given to developing offshore wind power projects in the course of boosting the flourishing wind power industry.

Offshore wind power construction is a priority in China this year. In January, the NEB said China would kick off construction of 1 GW offshore wind power projects in 2011.

The public tender for the 1 GW offshore concession projects, totalling four wind farms in east China's Jiangsu Province, was announced in October 2010. They will use Sinovel, Goldwind and Shanghai Electric

turbines.

The China Meteorological Administration has estimated China's offshore wind potential at more than 750 GW – far higher than the 253 GW potential for land-based wind.

China's eastern coastal areas, particularly Jiangsu Province, boast sound conditions to develop wind farms on beaches and in offshore areas.

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# Stress tests take shape



Mike Weightman: UK cannot afford to be complacent

While the EU has been debating the criteria of nuclear power plant stress tests, national regulators have started making recommendations for safety improvements.

Siân Crampsie

Stress testing of the EU's 143 nuclear power reactors is to start this month (June) but will not for the time being include 'man-made' events such as airplane crashes and terrorist attacks. The European Commission and regulators from EU Member States have agreed to the criteria that the stress tests will cover, but the Commission was forced to backtrack on an earlier pledge that disasters such as terrorist attacks should be included in the tests.

EU leaders agreed in March to recommend that Member States carry out voluntary stress tests following

the disaster at Japan's Fukushima Dai-ichi nuclear power plant, which was triggered by a magnitude-9 earthquake and tsunami.

The stress tests will focus on aspects of nuclear power plant safety highlighted by the Fukushima accident, including flooding, earthquakes, loss of safety functions and severe accident management. The results are to be peer reviewed by multinational teams of experts and shared between regulators.

The European Commission wanted man-made disasters to be included in the tests in order to make them as robust as possible, but several

Member States objected to this on the grounds of national security. France and the UK were among those opposed and are reported to have insisted that nuclear safety and nuclear security were two separate issues.

They were also concerned about the Commission's plans to make the results of stress tests against events such as terrorist attacks public.

Meanwhile the nuclear safety authorities of the UK, Finland and Germany (just prior to the policy U-turn) all released reports compiled in the wake of Fukushima that said that there is no reason to shut down nuclear power plants.

In the UK, an interim assessment of

the country's nuclear fleet makes 11 conclusions and 25 recommendations for improving safety. Mike Weightman, executive head of the Office for Nuclear Regulation, said that while a large earthquake and tsunami was not a credible event in the UK, the country's nuclear industry could not afford to be complacent.

"No matter what the differences are, and how high the standard of design and subsequent operation of the nuclear facilities here in the UK, the quest for improvement must never stop," said Weightman. "Seeking to learn from events, and from new knowledge, both nationally and internationally, must continue to be

a fundamental feature of the safety culture of the UK nuclear industry."

In May the Finnish Radiation and Nuclear Safety Agency (Stuk) said that it had found "no new threat factors or deficiencies that would require immediate safety improvements" at the country's two nuclear power plants. It said "a very powerful earthquake and extremely high tsunami are not considered possible in Finland".

Nevertheless, Finnish firms will have to satisfy the regulator that they have taken proper consideration of potential serious flooding, the need for sustained emergency power provision and improved self-sufficiency.

## Reversal of fortune for clean coal plants

Enel will have to start from scratch the approval process for a project to convert an oil fired power plant in northeast Italy to clean coal firing after Italy's top administrative court blocked its clearance.

The Italian energy company said it was "stunned" by the decision, which came in May after prolonged protests from environmental groups.

In the UK, meanwhile, the fortunes of energy company Powerfuel and its proposed 900 MW clean coal plant in northern England have been reversed thanks to a rescue deal put forward by 2Co Energy.

The ruling by Italy's State Council overrules the permit that was granted to Enel for the project by the Italian

Environment Ministry in 2009. It is a major setback for Enel's plans to develop zero-emissions power plant technology, which include clean coal projects as well as the development of carbon capture and storage (CCS) systems.

Enel cannot appeal the court's decision, so it will either have to start the approval process all over again, or find an alternative location for the project. The company is already considering ways of offsetting the impact of the government's decision to put its nuclear power programme on hold.

The €2.5 billion project would have converted the 2640 MW fuel oil fired Porto Tolle power plant to a clean

coal plant with a capacity of 1980 MW. Enel has also been developing carbon capture technology in a pilot project in Brindisi and was planning to scale it up for application at Porto Tolle.

Enel is working with Italian oil major Eni to develop carbon storage technology and had earmarked a saline aquifer below the Adriatic Sea for the permanent storage of carbon dioxide from the converted Porto Tolle facility.

The European Union granted Enel €100 million in funding from the EU economic recovery programme for its pilot project in Brindisi and for preliminary work on the Porto Tolle plant.

It took Enel around six years to get approval for the Porto Tolle project from the Italian environment ministry.

In the UK, 2Co Energy, a new company backed by a private equity firm, has agreed to buy Powerfuel Power from its parent company, Powerfuel, which went into administration last year.

Powerfuel Power Ltd was developing the 900 MW Hatfield IGCC project and won €180 million of funding from the European Union's economic recovery programme. The project has now been renamed the Don Valley power project and could be operational by 2016, says 2Co Energy.

2Co Energy announced in May that

Don Valley has been selected by the UK Department of Energy and Climate Change to be put forward to the European Investment Bank for funding under the EU's NER300 scheme.

The project is designed to capture and store up to 5 million tonnes per year, or 90 per cent, of the plant's CO<sub>2</sub> emissions. 2Co Energy is planning to store the CO<sub>2</sub> in North Sea oil fields, using it for enhanced oil recovery (EOR).

2Co Energy was formed in 2010 to provide CO<sub>2</sub> storage solutions for CCS projects. It aims to make revenues by selling oil left in oil fields that can only be extracted using EOR techniques.

## Vestas selects UK for 7 MW turbine facility



The Port of Sheerness in Kent could be the site of a new manufacturing plant

Wind turbine manufacturer Vestas has voiced its commitment to the European offshore wind industry by signing an option agreement that would enable it to build a new manufacturing facility in the UK.

The Danish firm recently launched its new 7 MW offshore wind turbine

and says that the size of the new unit warrants the construction of new manufacturing facilities.

It says that if the order intake for the V164-7.0MW unit is sufficiently high, it will take the option on 70 hectares of land at the Port of Sheerness in Kent, southeast

England.

The UK represents the world's largest offshore wind market and has a "massive" order pipeline, says Vestas. A number of manufacturers are involved in the development of next-generation, large-scale offshore wind turbine units,

including Clipper Windpower and Gamesa.

The UK's Energy Technologies Institute (ETI) recently launched a project to develop high-performance blades for the next generation of large offshore wind turbines with capacities of 8-10 MW.

## Torresol commissions Gemasolar

Torresol Energy has marked a milestone in its development plans with the commissioning of what it claims is the world's first commercial-scale concentrating solar power (CSP) plant featuring central tower receiver with thermal storage capabilities.

The 19.9 MW Gemasolar power plant in Seville, Spain has started supplying electricity to 25 000 homes in the Andalucía region of Spain. It comprises 2650 heliostats covering 185 hectares as well as a receiver and innovative molten salt storage system.

The storage system allows the plant to continue generating electricity in the absence of sunlight for up to 15 hours. The plant was described as a "revolution in the CSP sector" by Enrique Sendagorta, Chairman of Torresol.



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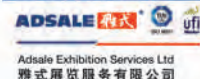
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# UN pledges five-point nuclear safety strategy



German President Christian Wulff is in favour of an international nuclear authority

Twenty-five years on from the Chernobyl nuclear accident, and just months after Fukushima, world leaders are calling for stricter international nuclear safety guidelines.

**Siân Crampsie**

World leaders are calling for the implementation of global safety standards for nuclear power plants to prevent the recurrence of major accidents such as those seen at Chernobyl and Fukushima.

German President Christian Wulff is in favour of an international nuclear authority with global jurisdiction, while Russian President Dmitry Medvedev recently argued for the creation of tough international nuclear safety guidelines.

Their comments came in late April as events took place to mark the 25th anniversary of the Chernobyl disaster in Ukraine. UN Secretary General Ban Ki-moon honoured victims of the disaster and said that he has put forward a five-point strategy for a safe nuclear future.

"This 25th anniversary of the Chernobyl disaster is a time for reflection – a time for robust global debate," said Ban. "Nuclear power will likely continue to be an important resource for many nations and can be a part of a low-carbon emission energy mix in our efforts

to address climate change. But it has to become credibly safe, and globally so."

Ban's five-point strategy includes "a top-to-bottom review" of current nuclear safety standards, both at the national and international levels, strengthening the work of the UN International Atomic Energy Agency (IAEA), putting a sharper focus on the nexus between natural disasters and nuclear safety, undertaking a cost-benefit analysis of nuclear energy, and building a stronger connection between nuclear safety and nuclear security.

"With the memory of Chernobyl and, now, the disaster in Fukushima, we must widen our lens," Ban wrote in an opinion piece published in the *International Herald Tribune*. "Henceforth, we must treat the issue of nuclear safety as seriously as we do nuclear weapons."

Ban became the first UN Secretary-General to visit the site of the Chernobyl disaster, which affected an estimated six million people and contaminated an area half the size of Italy. "It is one thing to read about Chernobyl, another to see it for

yourself," said Ban. "Anyone visiting that infamous site... will be profoundly moved."

The concrete sarcophagus at Chernobyl has exceeded its expected life and work has started on the construction of a new shelter for the reactor building that will be in place by 2015 and which will last 100 years. In April international donors pledged €550 million towards the cost of the new shelter, but more is needed, according to the Ukrainian government.

"What we need now is a shield to protect our wider world. A shield forged at the United Nations... a shield that will ensure that nuclear power plants are sources of peaceful energy – not potential catastrophe," said Ban.

While some countries have called a temporary halt to their nuclear power programmes in the wake of the Fukushima disaster, others – including Turkey – are pressing ahead with the construction of nuclear capacity.

Turkey's Energy Minister, Taner Yildiz says that the country needs nuclear capacity in order to enhance

energy security, but says that safety and security measures at nuclear power plants must increase.

Russian firm Rosatom is building Turkey's first nuclear power plant, which will be based on third generation reactor technology with both passive and active safety systems. The \$20 billion plant will be able to withstand a magnitude-9 earthquake and a plane crash, says Rosatom.

Fatih Birol, Chief Economist at the International Energy Agency (IEA) said in May that plans to scale back or halt nuclear power plant construction programmes could be highly damaging.

Speaking to the *Financial Times*, Birol said that low levels of nuclear growth would lead to higher energy prices, higher carbon emissions and lower energy security.

The IEA had predicted the addition of 360 GW of new nuclear capacity by 2035 in its last annual global energy outlook. Its next outlook – planned for publication in November – will now include a low nuclear case scenario of only 180 GW by 2035.

## UAE connects to Gulf grid

The inauguration of the second phase of the Gulf states' Dh5 billion (\$1.36 billion) electricity interconnection project marks a milestone in the development of the GCC Interconnection Grid project.

A ceremony marking the integration of the UAE grid with those of Saudi Arabia, Kuwait, Qatar and Bahrain was recently led by Sheikh Mohammed bin Rashid Al Maktoum, vice president and prime minister of the UAE and ruler of Dubai.

The GCC Interconnection Grid project is expected to reduce energy costs in the six Gulf states by allowing them to share and trade electricity resources. The network has been also used to extend fibre optic lines in order to strengthen the IT and networks infrastructure in the GCC countries.

Electricity demand in the Gulf region is soaring in response to sustained economic growth and development and the Gulf grid will provide part of the solution, said Essa al Kuwari, the chairman of the GCC Interconnection Authority (GCCIA), during the launch ceremony.

Although the participation of the final member, Oman, has been delayed for two years, studies are already underway examining the feasibility of extending the grid to other Arab countries as well as creating a connection with Europe.

Talks on trading electricity between the six Gulf grid states are continuing and trading is expected to start some time next year.

One of the Middle East's largest power and desalination plant was inaugurated in Fujairah's Qidfa area last month. The Fujairah F2 power and seawater desalination plant is the second largest of its type in the world, generating 2000 MW of electricity and 130 million gallons of water per day.

# US Ex-Im courts Kusile controversy

A major new coal-fired power plant in South Africa is drawing criticism after winning the financial backing of the US Export-Import bank.

The export credit agency has given its preliminary approval to loans totalling \$805.6 million to support construction of the 4600 MW Kusile project, which forms a major element of utility Eskom's plans to boost generating capacity in the country.

The project – and the loans – has come under criticism, however,

because of the environmental impact that the coal fired project will have. The heightened controversy surrounding the Kusile plant comes as Eskom fights a labour relations battle at the power plant construction site and at that of another mammoth coal-fired project, Medupi.

In May around 500 workers at Medupi and a number of contractors at Kusile held protests, leading to the closure of both construction sites. A statement from Eskom said that at

Kusile, protesters set fire to offices, two mobile cranes and vehicles.

Non-government organisations (NGOs) such as Pacific Environment say that Kusile will increase South Africa's carbon emissions, and have called on the US Ex-Im bank to review its lending policies.

The start-up of Kusile's first 800 MW generating unit is scheduled for 2014.

The loan from the US Ex-Im bank helped US engineering firm Black & Veatch to secure a contract for equipment and consultancy services at Kusile. The Ex-Im bank says that the plant will be the first in South

Africa to install scrubbers to control emissions of sulphur dioxide, and that the plant design will also allow for carbon capture and storage to be added at a later date.

The Zimbabwe Electricity Supply Authority (Zesa) says that it requires more than \$1 billion to increase the power generating capacity of the Hwange power station from its current output of 600 MW to 900 MW. Electricity demand exceeds supply in Zimbabwe and Zesa says it is owed \$450 million by electricity consumers. The utility also wants to increase the output of the Kariba South hydropower plant.

## Boost for small hydro in Georgia

Georgia is to develop its small hydropower capacity with the help of a € million renewable energy fund supported by German development bank KfW and the United Nations Development Programme (UNDP).

The fund will be the first of its kind in Georgia and will provide low interest loans for developers of small hydropower projects in the country. It will also assist the rehabilitation of existing small hydropower plants.

Georgia has 26 000 rivers and a hydropower potential of 15 GW.

# Tribunal rules on Siemens Areva NP exit

■ Four-year non-compete  
■ Siemens raises earnings outlook

Siemens is to pay compensation to Areva for abandoning its nuclear power joint venture, Areva NP.

An arbitral tribunal of the International Chamber of Commerce (ICC) has ruled that Siemens did not fully meet its contractual obligations towards its former joint venture partner, and will have to pay Areva €648 million plus interest.

The ruling comes more than two years after Siemens announced its intention to terminate its involvement in the Areva NP joint venture. Siemens completed the transfer of its stake in

Areva NP to Areva in March this year, enabling the German firm to book a sharp rise in its second-quarter profits for the year.

Earlier this year an independent expert valued Siemens' 34 per cent share in the Areva NP joint venture at €1.62 billion. Areva paid the full purchase price in mid-March 2011, according to a statement from Siemens.

The tribunal also limited the term of the non-compete clause in the two companies' partnership agreement to four years, placing a restriction on Siemens' activities in those parts of

the nuclear sector served by Areva NP until September 25, 2013.

The European Commission is investigating the validity of the non-compete clause, says Siemens.

In early May Siemens raised its earnings forecast for fiscal 2011 after reporting an 89 per cent rise in net profits for January-March 2011 from €1.48 billion a year earlier. It said that its gain from the sale of its Areva NP stake was €1.52 billion.

The German firm also reported a rise in its order intake of 28 per cent, boosted by the energy sector and

demand from emerging markets.

Siemens says that the charge for compensating Areva will affect the earnings of the current quarter.

Siemens exited the Areva NP partnership because its minority share did not allow it to exert strategic influence over the company.

It then started negotiations with Russia's Rosatom over the creation of a new nuclear partnership, but that deal has been on hold pending the outcome of the arbitration proceedings with Areva.

Siemens' shareholder agreement with

Areva – signed in 2001 – included a non-competition clause.

Areva has become the sole shareholder in Areva Koblitz after purchasing a 30 per cent stake in the company in May.

Areva acquired 70 per cent of Koblitz – a Brazil-based renewable energy and cogeneration technology firm – in 2008

and has since doubled the company's backlog. "Areva will use this opportunity to develop its entire renewables portfolio, especially solar thermal, on the fast-growing Brazilian energy market," said Anil Srivastava, CEO of Areva Renewables.



# Tognum approves revised offer

■ R-R mulls fuel cell business ■ Cash offer raised

Siân Crampsie

Daimler and Rolls-Royce look set to take over Tognum after raising their offer for the German engine maker.

Tognum's management and supervisory boards said last month that the increased offer of €26 per share was "appropriate" and recommended that their shareholders accept it. The deal values Tognum at €3.4 billion and will have benefits for all three companies.

"Together with Daimler and Rolls-Royce, we are going to create a global technology leader in propulsion systems and decentralised energy

systems. In doing so, we will further strengthen the Tognum Group's outstanding market position and substantially improve our prospects for the future", said Volker Heuer, CEO of Tognum AG.

Tognum's management rejected Daimler and Rolls-Royce's initial offer of €24 per share because it did not reflect the value added to the company since its flotation in 2007. The two acquiring companies intend to use Tognum as a platform for future growth in the decentralised energy systems and propulsion systems markets.

The deal includes a commitment by the acquirers to retain Tognum's

locations worldwide and to secure Tognum's technological leadership with research and development spending alongside capital expenditure. The transaction will open up additional growth opportunities from Tognum in the BRIC countries.

Rolls-Royce has also agreed to hold further talks with Tognum over the takeover of Tognum's fuel cell business.

Through the deal, the UK engineering firm will gain access to Tognum's fuel efficiency technology, which will help it make its products compliant with future emissions standards. The deal will allow Daimler to cement its role as an important supplier to Tognum.

# BP mulls next move as Rosneft deal founders

Oil majors BP and Rosneft say that they are still examining ways of cooperating after their proposed share swap deal collapsed in May.

The two companies' \$16 billion proposal foundered after a deal to buy-out BP's partners in its existing Russian joint venture, TNK-BP, was rejected. A deadline for BP and Rosneft to complete their deal expired and the Russian group was unwilling to extend it, according to reports.

BP and Rosneft may attempt to revive the deal or restructure it in order to change BP's role. Rosneft says that it is currently reviewing bids from other oil firms to develop

the Russian Arctic blocs, according to the *Financial Times*.

BP wants to seal a deal with Rosneft in order to give it new areas of growth. The Rosneft deal included a share swap between the two firms, plus the opportunity to explore and develop three licence blocks in the Russian Arctic continental shelf.

However the UK firm's existing Russian partners, Alfa-Access-Renova (AAR), with which BP jointly owns TNK-BP, objected to the deal on the grounds that it breached the TNK-BP shareholder agreement. BP offered to buy AAR's stake in TNK-BP for \$32 billion, but this was rejected.

# Gamesa plans technology investments

Gamesa is planning to diversify its technological footing by making capital investments in a range of new and renewable energy technologies.

The Spanish wind turbine company has announced plans to ring-fence €50 million for a corporate venture capital fund that will buy minority holdings in start-up or growth companies active in the clean energy

sector. The move will allow it to broaden its technical base and participate actively in other areas of growth aside from the wind business.

The move will also enable the company to capitalise on potential synergies with its existing manufacturing activities.

The company is intending to invest €50 million over five years in six

technologies: wave and tidal; next-generation photovoltaic energy; energy storage; electric vehicles; energy efficiency; and off-grid renewables. It will invest €3-5 million per transaction and in the medium to long term will consider taking the companies over.

Gamesa recently announced two investments in US-based off-grid

renewables companies. It paid \$3 million for a 29 per cent stake in SkyBuilt Power, which has developed products that mix photovoltaic and mini-wind technologies, and \$2 million for 25 per cent of WorldWater & Solar Technologies, which has developed systems for pumping and purifying water.

# Voith builds Japan presence

Voith Fuji Hydro has strengthened its position on the Japanese hydropower market through an agreement to buy Ebara Corp.'s hydro turbine business.

Voith Fuji Hydro, a joint venture between Germany's Voith Hydro and Japan's Fuji Electric, says that the acquisition will expand and strengthen its business in Japan. The company is the only Japanese full-line supplier in the country's hydropower market.

Ebara is selling its hydropower business in order to concentrate growth in its core competencies of fluid machinery equipment.



## Tenders, Bids & Contracts

### Americas

#### Enel orders Vestas units

Vestas Wind Systems has won an order to supply 200 MW of wind turbines to Enel Green Power North America for a project in the US state of Kansas.

Under the agreement Vestas will deliver and commission 111 of its V90-1.8 MW wind turbines as well as provide service and maintenance for five years. Elk County is scheduled for the second half of 2011, with commissioning starting towards the end of 2011.

#### Alstom lands Tres Amigas 'SuperStation' order

Tres Amigas LLC has placed an order worth €150 million with Alstom Grid for equipment and services for the first stage of the Tres Amigas 'SuperStation' project in New Mexico, USA.

The SuperStation is a power transmission hub that will ultimately interconnect America's three primary electricity grids. Alstom will provide a 750 MW, 345 kV direct current converter for the SuperStation as well as automation technology and high system maintenance services.

The SuperStation will facilitate the transfer of renewable energy from region to region as well as improve the reliability, efficiency and capacity of the grids.

#### Kepeco lands Dominican transmission contract

Korea Electric Power Corp (Kepeco) has won a \$46 million order from the Dominican government to build a power transmission line in the Caribbean nation.

The South Korean firm is scheduled to complete the 400 km line by May 2013.

#### Brazil boosts Vestas orders

Brazilian renewable energy firm Galvao Energia has placed an order with Vestas for 80 MW of wind turbine capacity for installation at three separate projects in Brazil.

Under the order, Vestas will deliver 40 of its 2 MW wind turbine units to the projects in Rio Grande do Norte state and will also be responsible for installation and commissioning. The order also includes a ten-year service and maintenance agreement.

Delivery of the turbines is expected to start in late 2012.

#### Emerson installs plant management in Brazil

Emerson Process Management is installing its PlantWeb digital plant architecture with Ovation expert control system at the Usina Termelétrica Luis Carlos Prestes power plant in Brazil.

Owned and operated by Petrobras, the 240 MW simple cycle power plant is being converted into a combined cycle facility. The new Ovation system will integrate the existing Ovation control system and the new Siemens steam turbines, as well as the BOP and electrical areas that are being expanded due to the new plant configuration.

#### ABB wins HVDC refurb

ABB has won an order worth about \$20 million from Vermont Electrical Power Company (VELCO) to refurbish a more than 25-year old HVDC (high voltage direct current) transmission station.

The original Highgate back-to-back converter station was delivered by ABB in 1985 and links the electrical systems of the state of Vermont in the US and the province of Quebec in Canada.

The project's scope includes the installation of ABB's state-of-the-art control and protection system MACH2, and replacement of the valves and valve

cooling system.

The upgraded station is expected to be in operation by the end of 2012.

#### Cheves orders ABB equipment

ABB has announced it has won an order to provide power equipment and engineering for the Cheves greenfield hydropower plant in Peru.

The 2 x 84 MW hydropower project is located in the provinces of Oyon and Huaura and will help to eliminate voltage fluctuations and power cuts in the region when it comes on line in late 2013.

ABB Canada will execute the project in conjunction with Rainpower and Jeumont, with ABB responsible for the complete electrical balance of plant. Rain Power will supply the turbine and Jeumont, the generator. The consortium's scope includes the installation and commissioning of equipment.

### Asia Pacific

#### Gamesa signs 2 GW India agreement

Spain's Gamesa has signed a framework agreement with Caparo Energy India Limited (CEIL) to deliver wind turbines with a combined capacity of 2000 MW over the next five years.

The deal includes Gamesa's G58-850 kW and G97-2.0 MW turbines. The units will be delivered between 2012 and 2016, with around 150 MW of capacity scheduled for 2012.

Gamesa will produce the turbines at its factories in India.

#### Two contracts for Voith in China

Voith Hydro has won two contracts in China that will add a total of 1880 MW of new capacity to the grid.

Voith has signed a contract with Da Tang YanTan Hydro Power Company for the extension of the Yan Tan hydropower plant on the Hongshui River in Guangxi Zhuang Autonomous Region. It has also won an order from Huanghe Hydro Power Development Company, which is building the Yang Qu hydropower plant on the Yellow River.

Voith will supply the generators for two 340 MW units for the Yan Tan project and three 400 MW Francis turbines for the Yang Qu project.

#### CRP places wind order

China Resources New Energy Group, or CRP-Renewable, the renewable energy arm of China Resources Power, has placed an order with Gamesa for 300 MW of wind turbine capacity for six wind farms in China.

Gamesa will deliver 150 of its G90-2.0 MW turbines to CRP in the second half of 2011 to the wind farms, which are in the Chinese provinces of Heilongjiang, Shanxi and Guangdong. The contract forms part of a memorandum of understanding (MOU) signed by Gamesa and CRP in April 2011.

Gamesa has also signed MOUs with two other Chinese companies, Longyuan and Datang.

#### PGCIL orders transformer for Jabalpur

Power Grid Corporation of India Ltd. (PGCIL) has placed a \$15 million order with ABB for the supply and commissioning of an ultra-high voltage transformer for the Jabalpur pooling station.

Under the contract, ABB will supply, erect, test and commission 500 MVA, 765 kV autotransformers at the site, which will receive power from the eastern Indian state of Orissa and

distribute it within the central state of Madhya Pradesh. Commissioning is scheduled for 2013.

#### Indonesian IPP places gas turbine order

Independent power producer (IPP) PT Cikarang Listrindo has selected GE gas turbine technology for a 114 MW power project being developed near Jakarta.

GE will provide a Frame 9E gas turbine and associated generator for the plant, which will run on natural gas in order to support the Indonesian government's commitment to a low carbon development path.

GE has already supplied eight other gas turbines to Cikarang Listrindo for power projects in Indonesia.

### Europe

#### Sanko inaugurates Yedigöze

Turkish industrial holding Sanko and Alstom Power have officially inaugurated the 320 MW Yedigöze hydropower plant on Turkey's Seyhan River.

The facility is part of Sanko's programme to build additional renewable energy capacity, in line with the government's push to improve Turkey's energy security by increasing the share of renewable energy. In 2008, Sanko awarded Alstom the contract for the turnkey supply and commissioning of Yedigöze's two 160 MW Francis hydro turbines and two 175 MVA hydro generators, as well as all auxiliary equipment.

#### Nordex wins Blaiken order

Germany's Nordex has received an order for 60 wind turbines with a combined capacity of 150 MW for an onshore wind power project in northern Sweden.

Nordex will deliver its 2.5 MW N100/2500 wind turbine units to the Blaiken wind power project, which is backed by Finnish energy firm Fortum and Swedish municipal utility Skelleftea Kraft AB. The units will be equipped with Nordex's anti-icing system for rotor blades.

#### Alstom and Nexans partner on Maltese HVAC project

Maltese utility Enemalta Corporation has awarded an Alstom-Nexans joint venture the turnkey contract for the construction of the high voltage alternating current (HVAC) submarine electrical interconnector between Malta and Sicily.

At the Malta end of the interconnection, Alstom Grid will supply the 220/132 kV gas-insulated substation (GIS) while at the Sicily end it will reinforce the existing substation equipment to support the connection with the new substation in Malta.

The project will be completed in 2013 and will reinforce the electricity supply in Malta.

#### Veidekke awarded Lista Wind contract

Lista Wind Power Plant AS has awarded Veidekke Entreprenor AS a NOK208 million (\$38.2 million) contract for the construction of the Lista wind power project in Norway's Farsund municipality.

Under the contract, Veidekke will complete the design, construction, installation and commissioning of the 102 MW wind farm, which will feature 31 wind turbines.

Completion of the project is scheduled for early 2013.

### International

#### GE powers Winter Games

GE is to supply two LMS100 PB aeroderivative gas turbines to Russia for installation at a project that will help to power the 2014 Winter Olympic Games in Sochi.

The two units will be equipped with the latest emissions technology and will provide both base load and peak load power for the Olympics.

#### Kuwait orders Az Zour electrical solutions

ABB has won an order worth about \$22 million to supply electrical equipment and power systems for the Az Zour South power plant upgrade project in Kuwait.

ABB is to supply the electrical balance of plant, the DCS, field instrumentation and generator transformer for the expansion project, which will add 400 MW of generation capacity to the combined cycle plant, 80 km south of Kuwait City. The project scope also includes the extension of the 275 kV GIS substation, medium- and low-voltage equipment and the substation automation system.

The project is expected to be completed by March 2012.

#### RusHydro to modernise Kubansky Cascade

Alstom Hydro France, Alstom Russia and the Russian United Energy-Construction Corporation (OEK) have signed an agreement with RusHydro, Russia's largest hydropower generation company, to modernise the Cascade of Kubansky hydropower plants in Russia.

Under the agreement Alstom will carry out the rehabilitation of electro and hydro mechanical equipment as well as install a new instrumentation and control system. OEK will be responsible for all civil works.

The Kubansky Cascade hydropower plant complex on the Kuban River in southern Russia includes eight hydropower plants and one pumped storage power plant with a total original capacity of over 460 MW.

#### Siemens to build Abu Dhabi substation

Siemens Energy has signed an agreement worth €100 million with the Abu Dhabi Water & Electricity Authority (ADWEA) and the Abu Dhabi Transmission and Despatch Company (Transco) to build a new turnkey 400/132 kV substation.

The new substation will help to meet increasing power demand in Abu Dhabi, and will also allow Transco to reconfigure existing 400 kV and 132 kV overhead line circuits to improve system reliability.

The substation will be completed in 2013, and will be the main source of power supply for major development projects in Mussafah, Mohamed bin Zayed City, Mahawi, Watbha, Khalifa City, Old Airport and Capital District.

#### GE wins Saudi extension contracts

The Saudi Electricity Company (SEC) has selected gas turbine technology and services from GE Energy for four power plant extensions.

The fast-track plant extensions will help SEC to meet peak summer demand and add 1680 MW to the grid. Equipment to be supplied by GE includes three 7 FA gas turbines, 18 7EA gas turbines, one D11 steam turbine and a number of generators.

The total value of the agreements is expected to be more than \$500 million, and brings GE Energy's orders for SEC projects in the last two years to more than \$2 billion.



# Reinventing Europe: delivering investment for a low-carbon economy

Europe is standing at an unprecedented energy crossroads, facing an urgent need for sizeable investment in power generation and grid infrastructure in the near future. This requires a rethink of challenges as well as of opportunities.

**Hans ten Berge**

At EU level, the European Commission has proposed a European strategy for energy infrastructure, which will involve a massive upgrade of capacity and installations from the power sector. In addition, meeting the EU's ambitious 20/20/20 targets on reducing emissions, increasing renewables consumption and energy efficiency by 2020 implies that power generation from renewables will have to reach a share of almost 35 per cent of total power generation.

European power companies are facing an unfavourable investment climate. Complicating matters even further, policy fragmentation at EU and national level and new taxation rules increase legal and regulatory uncertainty, and make companies review their investment plans.

According to Commission estimates, total investments of €1 trillion in generation and infrastructure are needed up to 2030, which means a substantial boost from the current investment levels of today. With all attention turned towards ensuring an affordable, secure and sustainable economy, it is time to shape the vision of the major role of electricity for the future.

Failing to set the right investment climate will affect Europe's economic lead in green technologies and, more generally, our objective for a transition to a low-carbon economy. Despite major steps forward in specific areas in recent years, there is need for more. Policy uncertainty at the EU level remains a particular stumbling block. Without a stable regulatory framework, deficits in renewables growth, energy infrastructure and market regulation will act as major deterrents to low-carbon investment.

Investing in renewable energy sources (RES) is essential if Europe truly wants to position itself as a leader in green technologies. Yet current policies of some European governments offset this ambition. Competing national support schemes for renewables via rigid feed-in tariff systems have led to increasing shares of 'ring-fenced' generation, turning what should be a European internal energy market into closed separate markets maintained by costly subsidies. The result is a system with high costs for RES and low incentives to invest due to inefficiency and high uncertainty for investors. In some countries, initially generous renewables subsidies are now being revised, further confusing the investment climate for renewables.

To promote renewables growth, choices have to be made according to geographical advantages, appropriate technologies and the right incentives. First of all, investments should be targeted in locations where the cost is lowest and not where subsidies are highest. In addition, in order to deliver a more coordinated approach to RES mechanisms, national support schemes should be progressively phased out after 2020, and replaced with a strong carbon signal. An EU-wide coordination of renewable support schemes will ensure that investment in renewables becomes more effective, delivering more value for money.

In light of the Fukushima disaster and as plans of phasing-out nuclear power projects are taking root in Europe, the need to replace power capacity has come to the forefront of the discussion. While this development is likely to open the doors for more

conventional power, especially gas, in the short term, a surge in renewable energy sources is likely to take place in the medium and longer term. Yet an increasing share of variable renewables, such as photovoltaic or wind power, which are more challenging for the electricity system, will also need extensive investment in grid modernisation, flexible back-up capacity, storage facilities and R&D.

Notwithstanding this sense of urgency, member states fail to recognise the need to shed old habits and take on a more proactive role in tackling this issue. Lengthy administrative and permitting procedures and a lack of public acceptance remain major obstacles that delay the indispensable grid investments. And the clock is ticking: the average European power line currently takes a challenging 12 years to complete.

To support variable renewables and maintain the stability of the electricity system, it is important to adopt a new system approach, which encompasses all the options available. Variability requires back-up capacity initially from conventional – dispatchable – generation. Later on, we see an increasing role for developing storage facilities, demand side measures, smart grids and more interconnections. In the short term, up to 2020, interconnections and improved hydro and pumped storage are the most likely facilities to be used, with others following suit once the business cases are established. Combined with the flexibility of smart grids, these tools will be an essential part of a cleaner and more intelligent energy system. To secure investment in smart grids, however, strengthened regulatory and financial mechanisms should be created in order to lead the way for smart grids deployment in the EU.

Investment in grid expansion and modernisation, back-up capacity and new innovative technologies will take a concerted effort from all stakeholders, not least the energy industry. A large share of investment will – and should



**Hans ten Berge: we need to tilt the balance from a national to a pan-European perspective on energy policy**

full auctioning of CO<sub>2</sub> emissions allowances as of 2013, the electricity sector will have to pay the market price for all its carbon emissions, and this cost will be taken into account in any future plant investment decision. Unilateral attempts to introduce new regulation in this area distort this mechanism. Nor can they be justified on environmental grounds, as emissions from the ETS sectors are in any case capped.

We consider that a technology-neutral ETS system with long-term visibility

## Competing national support schemes for renewables via rigid feed-in tariff systems have led to increasing shares of 'ring-fenced' generation

– be borne by market players, as markets are the most efficient instruments to drive investment. At the same time, markets evidently do not operate in a regulatory vacuum, and a certain degree of public support is certainly needed. However, policies and regulation should be tailored to markets and investors in ways that prevent distortion and leaves to the markets the decision of choosing the right technologies to invest in.

The lack of a stable regulatory framework and conflicting policies also undermine the ability of key policy instruments such as the EU Emission Trading Scheme (EU ETS) to foster investment. The attempts of some member states to introduce their own sets of emission performance standards (EPS) and carbon floor prices on power plants are a prime example. Unilaterally raising the cost of carbon while favouring certain energy technologies does not necessarily lead to the required innovation. On the contrary, these measures could eventually lead to increased prices for electricity and for consumers. With the

will be the strongest driver for accelerating growth in the sector. Properly constructed (i.e. with long-term targets) and with continued political support, the EU ETS will provide a reliable cap on carbon emissions, which will act as a signal for market participants, including power generators, to direct their investment towards less carbon-intensive production in an economically efficient manner. As a result, CCS and other low-carbon technologies will over time become competitive.

Finally, policy targets around energy efficiency also fail to properly address investment. Without a doubt, energy efficiency represents a cost-effective way of helping Europe reach a low-carbon economy. Yet the lack of an adequate regulatory framework, together with uncertainty on future incentives, is proving a real hurdle to energy efficiency investments, notably at local level.

This is borne out in a recent survey conducted by Eurelectric; it reveals that power companies already offer

energy efficiency services to their customers but are struggling with a lack of customer awareness and interest, high costs and risks, and uncertainty surrounding regulatory support. Unsurprisingly, many new projects have thus been put on hold or are facing significant delays.

The much needed investment in generation, grid infrastructure and energy efficiency will not be achieved without systematic policies and market-based incentive mechanisms. For real progress to be made, we need to tilt the balance from a national to a pan-European perspective on energy policy. The need for a systematic regulatory framework and a stable investment climate is paramount. Member states should look beyond their own interests and adopt a more European approach to energy.

To this end, the European electricity industry is willing to work together with policymakers and regulators to find solutions that ensure that adequate investment can take place. This will not be an easy task, but will be indispensable to pave the way for a more robust energy market. Eurelectric's recent statement, 'European Energy at a Decisive Crossroads', addressed to the European Council, has taken a first step in pinpointing key flaws of the current framework and providing recommendations for investment and growth. The Eurelectric Annual Conference in Stockholm on 13-14 June, "Delivering Investments to Meet Europe's Energy and Climate Needs", will provide an ideal setting to continue this discussion among stakeholders. We hope this event will mark a turning point for the future of a low-carbon economy – the reinventing of Europe.

*Hans ten Berge is Secretary General of Eurelectric*

## Oil

# High crude prices affecting global demand

- Global demand shows marked slowdown
- No sign that prices will fall

David Gregory

The latest reports from the Paris-based International Energy Agency (IEA) and the US Department of Energy's Energy Information Administration (EIA) say that high crude oil prices are impacting demand. But despite this there is no sign that prices will fall in the months ahead and little indication that Opec will take steps to put more oil on the market when it gathers in Vienna this month (June).

In its May *Oil Market Report*, the IEA said that its estimates for global demand show a marked slowdown, with March data suggesting near zero annual growth for the first time since the summer of 2009. "Forecast global oil product demand growth for 2011 is trimmed on persistent high prices and weaker IMF GDP projections for advanced economies," the IEA said.

Demand averaged 87.9 million b/d in 2010, an increase of 3.3 per cent or 2.8 million b/d, according to the agency's data, but it put the demand forecast for 2011 at 89.2 million b/d, a rise of 1.5 per cent over 2010, or an increase of only 1.3 million b/d.

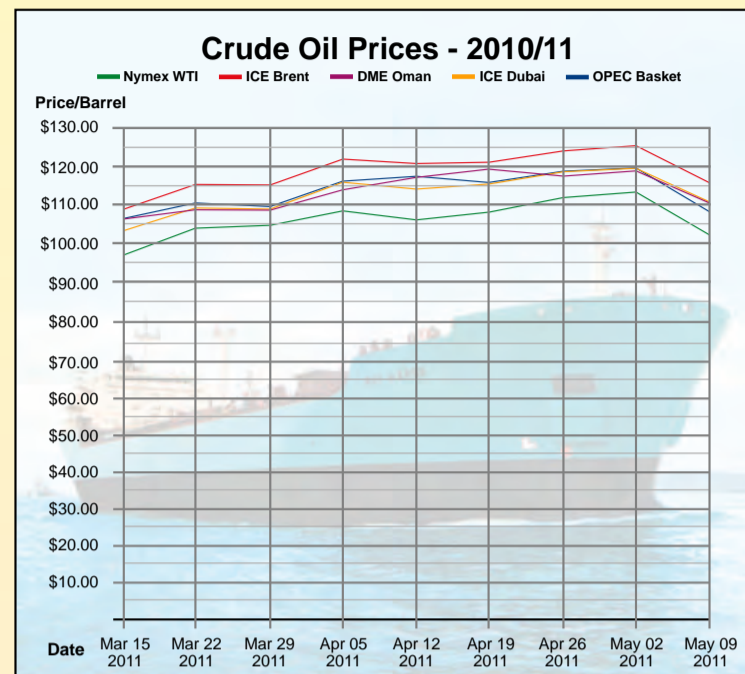
The IEA also pointed out that supply continues to trend downward. Global supply declined by 50 000 b/d during April to 87.5 million b/d. Opec produced 28.75 million b/d during April, down by 235 000 b/d from March and by 1.3 million b/d from January. The agency forecast that the call on Opec crude would rise by 800 000 b/d from an average of 29.3 million b/d during the second quarter of 2011 to 30.1 million b/d during the third quarter.

The decline in Opec production is attributed to the continuing civil war in Libya, which usually produces about

1.5 million b/d on average. Libya's crude oil production estimates for April have been put at 150 000 b/d and even if that figure holds, it is clear that the country's political problems will need to be resolved before Libyan crude oil comes back on the market in any significant way.

The EIA, in the May issue of its monthly *Short-Term Energy Outlook*, pointed out that spot prices for West Texas Intermediate (WTI) crude oil averaged \$89/b in February, \$103/b in March and \$110/b in April. It noted that the price of WTI dipped in early May but forecast that it would average \$103/b in 2011 and reach \$107/b in 2012.

"Despite the moderate downward revision to the outlook for oil prices," the EIA report said, "the rise in crude oil prices from last year continues to imply higher petroleum product prices



this year compared with last".

The US agency said that world consumption of crude oil and liquid fuels averaged 86.7 million b/d in 2010 and forecast that consumption would increase by 1.4 million b/d in 2011 and by 1.6 million b/d in 2012 to 89.7 million b/d. It said that countries outside the OECD would account for almost all of the growth in demand over the next two years, led by China, Brazil and the Middle East.

Meanwhile, there is little reason to expect that Opec will act to put more crude oil on the market in an attempt to bring prices down. Many of the Arab members of Opec are facing varying degrees of social unrest and are keen to have the extra revenues to fulfill promises made to their restive populations and also to boost domestic security.

Critics of Opec say that it should

have taken note of rising demand when the market began to tighten last year and put more crude on the market. There have been calls that it replaces the 1.5 million b/d of Libyan crude that has disappeared from the market. Also now figuring in the supply situation is the fact that exports from Yemen, which produces about 300 000 b/d, has been affected due to continuing unrest there.

Opec has stated on several occasions that it is prepared to meet market needs, but as yet it sees the market sufficiently supplied. In the latest issue of Opec's *Monthly Oil Market Report*, the group said "the global supply picture remains healthy," and that "ample spare capacity, adequate stock levels and lower demand for Opec crude during the first half of the year are factors that should be sufficient to support market stability."

## Gas

# Poland looks to shale gas for energy independence

Despite concerns about the possible environmental hazards of shale gas drilling that are being debated in many European countries, Poland has decided to move ahead with a programme to develop its huge reserves.

Mark Goetz

Speaking in Warsaw at a recent conference focusing on the shale gas drilling, Poland's Foreign Minister Radek Sikorski said exploring for shale gas was an "opportunity and an obligation". He said "it is a chance to limit both Poland's and Europe's dependence on gas imports" – a reference to the fact that Poland imports 70 per cent of its gas demand from Russia and that Europe relies on Russia for more than a third of its gas supplies.

Poland hopes to achieve the energy security that the US has obtained through the development of its shale gas reserves. The US Energy Information Administration (EIA) recently estimated that Poland's gas reserves at some 5.3 trillion m<sup>3</sup>. Based on Poland's current annual gas demand of 14 billion m<sup>3</sup>, the country's gas reserves could keep it supplied for several hundred years.

The EIA estimated Europe's shale gas reserves at 17.5 trillion m<sup>3</sup>, compared to 24.5 trillion m<sup>3</sup> in the US. But doubts in Europe about the environmental problems that have been assigned to shale gas have led to calls from environmental groups that drilling be curtailed.

Drilling for shale involves a technique called hydrofracturing, or fracking. Companies drill into porous rock and pump large volumes of water, sand and chemicals into the rock causing them to fracture and release the gas contained inside.

Environmentalists say the process can contaminate underground water sources and reports in the US say that residents have experienced methane gas escaping from water faucets in their homes.

But Mr. Sikorski said: "We just have to keep explaining to environmentalists and local people what it's about. From what I know, the technology keeps

improving," he said, adding: "New technology always carries new risks."

But France has shown that it is so far not willing to take the risk. In early May France's lower house of parliament passed a draft bill that would ban shale gas drilling that used the fracking technique. The bill, which is due to be debated further this month (June), would also revoke the shale gas drilling licenses in France that have already been issued.

But the French government's position is not shared by Total, the country's largest oil and gas company.

Total announced on May 13, only a few days after the French parliament action, that it would farm in to shale gas concessions held by ExxonMobil in Poland. Total is to take 49 per cent of the Chelm and Werkowice licenses while ExxonMobil will keep a 51 per cent share.

"The entry into these concessions reflects Total's commitment to

expanding activities in unconventional gas, notably in Europe," the company said in a statement.

Poland awarded the Chelm and Werkowice contracts for a period of five years in March 2009 and December 2008, respectively. They cover tracts in the Lublin Basin in southeastern Poland of 1162 m<sup>2</sup> and 995 m<sup>2</sup>. The work programme for each concession comprises acquisition of seismic data, drilling of an exploratory well and a production test if drilling results are encouraging, Total said. It added that ExxonMobil has already acquired some seismic data and drilled one well in the Chelm concession that is now being evaluated.

Other major international oil companies are also active in exploring for shale gas in Poland, including Chevron, ConocoPhillips, Marathon Oil and Eni. Shell, BP and Centrica are reported to be examining the possibility of becoming involved there.

Meanwhile, not everyone is convinced that shale gas will prove to be the game changer in Europe that it has been in the US. A report released by Bernstein Research in early May said shale gas activity in Europe is not expected to bring large amounts of unconventional gas to the market this decade.

"While we expect pockets of success in Europe and the small exploration and production companies associated with these forays to be successful, we do not expect material volumes to materialise during this decade," the research firm said.

The report said only 16 shale gas wells have been drilled in Europe and that only four of those have shown gas reserves compared with some 40 000 producing wells in the US. It added that most shale gas exploration has taken place in Poland, where the government has granted 44 exploration permits.

# Sombre mood surrounds CCS

Industry players speaking from this year's annual CCS conference in Pittsburgh, USA, air their frustration at the delay in moving carbon capture and storage to the next stage.

## Junior Isles

The Global CCS Institute (GCCSI) has identified as many as 234 carbon capture and storage (CCS) projects in its database, ranging from bench-scale, up to large-scale projects. It is a figure, which according to the Institute, is increasing.

Speaking on the sidelines of this year's 10th Annual CCS conference in Pittsburgh, Barry Jones General Manager of Policy and Membership at the Institute said: "While there has been a lot of churn, where some projects have come on and some have dropped off, the overall net number of projects is increasing."

According to the Institute there are 77 large-scale integrated CCS projects covering the full chain from capture to storage, a number that Jones says is also increasing. He notes, however, not many of these full-scale integrated projects are in operation or even in the construction phase.

"There is a lack of momentum at the full scale level. We are seeing projects advancing through the pre-construction phase but we are seeing a bit of a stalling before the final investment stage. Due to the financial crisis, as well as a lack of momentum in the policy process for putting a carbon price in place, we are seeing a banking-up of projects before the final investment decision."

Bob Hilton, Alstom Power's Vice President of Power Technologies for Government Affairs, echoed this view. He said that while technology has moved, the industry was being held back by the other pieces of the jigsaw. "We know we can capture carbon and put it in the ground. The issue is that we lack the drivers that will deliver the financing to drive the large projects forward."

Hilton observed that this made for a "sombre attitude" at the conference. "These are difficult times in terms of both government

and private funding," he said. "In the US, the DOE has been having difficulty in getting matching funds when appropriating out government funds for projects. Due to the economic crunch we are beginning to see cutbacks everywhere, which is having an impact. We are in a bit of a lull because we can't get the big projects moving."

The US-based Electric Power Research Institute (EPRI) also said that the policy and finance issues were holding back CCS deployment. It noted that US interest has waned because few new coal fired plants are being constructed.

Stu Dalton Director of Generation at EPRI said: "Utilities are concerned that there is no clear policy. There is a reluctance to put hundreds of millions or even billions of dollars on the table when there is no regulatory or financial clarity."

In countries outside the US, the lack of policy certainty is also making it very difficult. In

being slightly ahead of the US at this stage. The next step is moving to a larger demonstration scale.

Even countries such as China and India – which are heavily dependent on coal but have no immediate plans of building power plants with CCS – are interested in technology developments.

Dalton said: "Countries are looking at some opportunities to get the small-scale work done and understand their own situation, particularly in China."

China has an ability to drive policy that perhaps does not exist anywhere else. This – combined with the fact that with its heavy coal usage, it will have the greatest need for CCS – could see it become the leader in commercialising the technology.

Tom Stringer, Director, R&D Execution, CCS, Alstom Power commented: "A couple years ago when there seemed to be a bit more momentum behind pushing CCS, many of us felt that Europe was perhaps taking the lead with North

immediate use for CO<sub>2</sub> could be an important CCS driver, especially in the absence of a strong carbon price. However, beyond its use for enhanced oil recovery (EOR), some industry observers do not see many worthwhile opportunities. "We can get the benefit of EOR for early projects in some areas and that's a potential driver. But the research on utilisation beyond EOR is very much at an infant stage," said Hilton.

The problem is finding an application that is big enough to make a dent in the amount of CO<sub>2</sub> that is captured. "EPRI has done an analysis of all the commodities in the world and currently there are no applications big enough to drive the market," added Dalton.

But even EOR is unlikely to be enough to drive projects forward. There was a possibility of adding another CO<sub>2</sub> capture unit to supply the successfully operating pipeline that sends CO<sub>2</sub> from a gasification plant in North Dakota to Weyburn where it is used for EOR. Even with an existing pipeline, a user in Weyburn and other possible users, EOR was not enough to make the project commercially viable.

Stringer explained: "EOR has the potential for revenue streams. The challenge, however, is you are trying to bring together a commercial model in the EOR world with what, at the present, is a pre-commercial model in CCS. It's hard to make that work."

Aside from the commercial challenges, there is also the issue of geography. EOR is not always where the CCS projects are.

But despite the challenges, many experts and organisations such as the International Energy Agency agree that CCS has to be part of the long-term solution in order to achieve CO<sub>2</sub> emissions reduction targets at the least cost.

According to EPRI, the use of CCS and nuclear versus not having these options will save on the order of \$10 trillion in the cost of cutting carbon emissions by 2050. Yet there is a danger that CCS is losing impetus within governments. Dalton said: "We are at the point where this really does make a difference in the long term. The challenge is how do we get there from a current situation where it is difficult to attract the money and there is political uncertainty."

Jones added: "Despite the short-term financial difficulties being faced by governments, we have to keep the momentum going because in the long run CCS has to be part of that least cost solution point."

There is also the concern that positive public opinion is being lost. Hilton concluded: "A 3-5 year delay geometrically increases what you have to do. This should have a significant impact but it doesn't resonate anymore. This is partly because governments are focussed on financial issues and everything [else] is off the table. One thing governments do listen to is the people, so it's important to refocus them on the issue."

Renewable energy has captured public attention as an essential tool in the fight against global warming. Putting CCS in the minds of the public in much the same way, however, will be no small task. It could be a long, hard road to wide scale commercial rollout.

... the use of CCS and nuclear versus not having these options will save on the order of \$10 trillion in the cost of cutting carbon emissions by 2050

Australia, carbon tax proposals and the government's push for an emissions trading scheme are being questioned by a number of industries and organisations. This is despite the fact that a recent opinion poll showed that the majority of Australians believe that human-induced climate change is a problem.

Dalton added: "It's a similar situation in Europe. It's hard to get policy clear and finance – even if we can get the technology straight."

Technology development is perhaps the one positive area for the CCS industry. There have been a number of successful pilot scale projects, with Europe perhaps

America closely behind. It was felt that China had huge potential but was still at least 3-5 years behind. Now, the two western areas have slowed a bit while China is coming up the curve fast. We used to think that China could be several years after we get things developed in the west but now it could well be the other way around."

China has in fact been making rapid progress in clean coal technology in recent years. Its GreenGen project in Huaneng will in the first instance be an IGCC power project but there are plans to add capture on a slipstream of exhaust gas from the power plant in a few years. Following years of buying gasifiers from the West, the country is now selling Chinese-designed gasifiers to the West and is now working on developing its own CCS technology.

The Global CCS Institute is also carrying out work in Guangdong province to help the authorities understand what it means to be "CCS-ready" and how to characterise their potential for CCS.

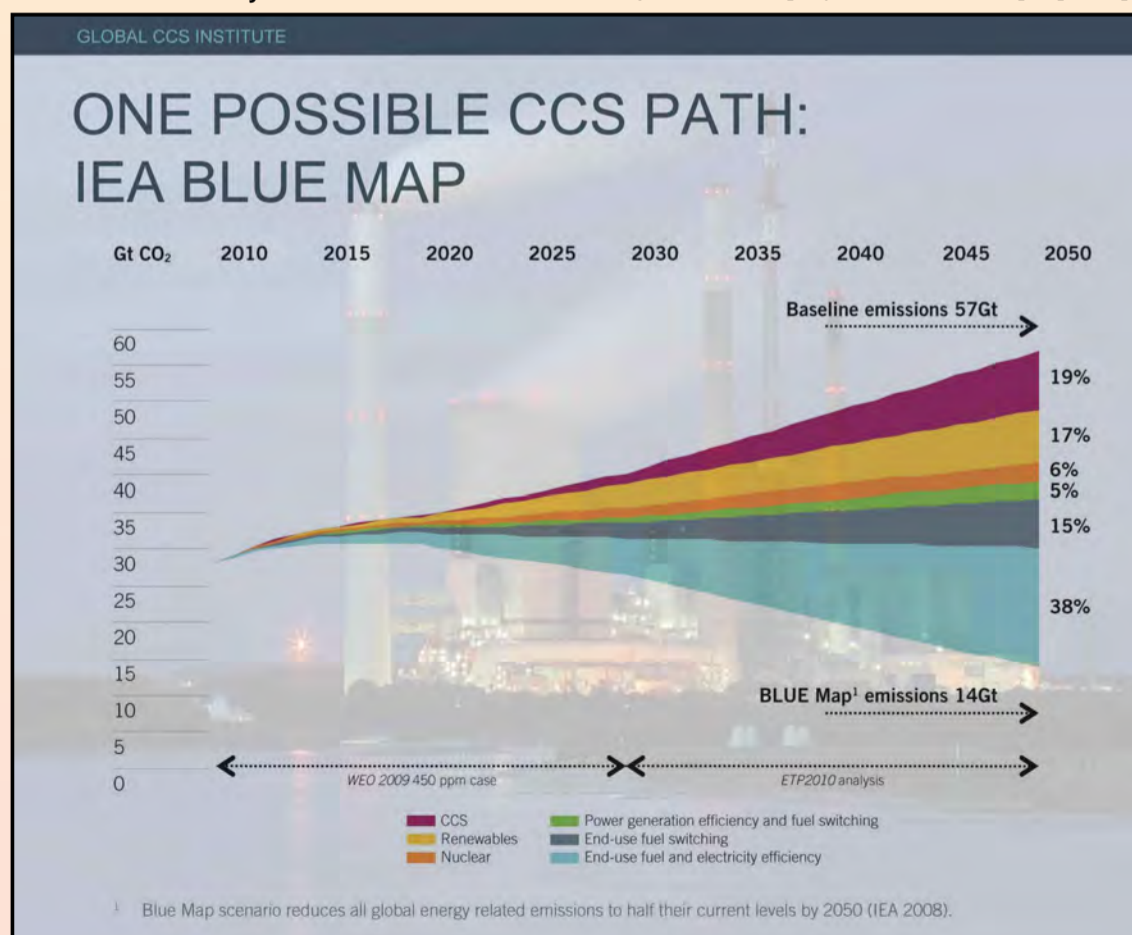
Comparing China with India, it was noted that China is further along the development path. Jones said: "China is not building power plants with CCS yet but they are certainly keeping up with the technology. There are demonstration projects under way and it is more advanced [than India] in terms of determining its geological storage potential."

Unfortunately, India has experienced major industrial disasters like Bhopal, which is negatively influencing public perception about processes like CCS.

Public perception was in fact a topic of debate at the conference. It is still an issue that the industry has to grapple with even though it is a "proven technology". As Jones explained: "We know how to do it right across the chain yet there is still a public perception of risk and uncertainty that we need to overcome."

It has been argued that having an

In the Blue Map Scenario (450 ppm CO<sub>2</sub> in the atmosphere) from its *Energy Technology Perspectives 2010*, the IEA calculated the impact of various low-carbon technologies in cutting CO<sub>2</sub> emissions to half their current levels by 2050.





# Flexible at 60

Combined cycle gas turbine power plants have entered a new era. Last month Siemens reached an historic landmark as the Irsching 4 plant recorded an efficiency of more than 60 per cent. Meanwhile, GE announced the introduction of a combined cycle plant it said would also operate at better than 60 per cent efficiency. Notably, both plants will also offer the flexibility needed to facilitate the increasing amount of variable renewable generation on today's grids.

**Junior Isles reports.**

The promise of 60 per cent efficiency for a combined cycle gas turbine plant has been long in the making. Now both Siemens Energy and GE Energy are boasting plants that are capable of breaking through a barrier, which has been to the power industry much like the 4-minute mile was to athletics.

Notably both power plants are also designed to offer the high level of flexibility that is so important in supporting the amount of variable renewable generation being introduced to today's power grids.

The timing of the two announcements, which came within the space of a week last month, coincides with the launch of a new book by the International Energy Agency entitled *Harnessing Variable Renewables: a Guide to the Balancing Challenge*, which highlights the importance of flexible generating sources in balancing increasingly variable supply and demand.

Siemens officially confirmed the performance and operating data of the new SCC5-8000H combined cycle power plant at a press visit to E.ON's Irsching power plant complex near Munich, Germany. It said that on May 6, 2011, Irsching 4 unit achieved an output of 578 MW at a record-breaking net efficiency of 60.75 per cent under design conditions for the engine. It also demonstrated the ability to achieve peak change rates of up to 35 MW/min, going from a stable minimum load of 100 MW to full load in less than 30 minutes. It is also able to run down to minimum load or zero within 30 minutes, said the company. These runs were demonstrated under the supervision and verification of the independent expert TÜV.

A plant of this size and flexibility will play an important role in E.ON's expansion of renewable generating capacity. In 2010 the company invested more than €1 billion in renewables and plans to invest a further €2.6 billion from 2011 to 2013.

Speaking at the announcement, Klaus Hammer, E.ON's CEO for Gas-CCGT Generation Fleet, noted: "Flexible power plants are required for better integration of weather-proofed renewables. This is where modern gas turbine power plants come into the equation. E.ON has already invested a great deal in combined cycle power plants. For example, by late 2011 more than 8500 MW of new capacity will have been installed in eight European countries."

Dr Michael Suess, CEO of Siemens Energy

commented: "Flexibility is really important. In the 1980s, 1000 sources in Germany provided 80 per cent of the power supply. By 2020 or a little later, 50 per cent of the supply will come from more than a million sources. This is a challenge for the grid on one side and also for the [generating] sources on the other side. On a sunny day in Bavaria – for example – installed photovoltaic systems produce over 50 per cent of the required electricity. But we obviously need flexible and speedy capacity to compensate for those times when the sun doesn't shine. And just as important – this capacity should be as efficient as possible to satisfy all climate requirements."

Combining flexibility with high efficiency is, however, a challenge, usually resulting in a trade-off of one against the other. Siemens says that overcoming this challenge was one of its main goals from the outset.

Willibald Fischer, Siemens' Programme Director for the 8000H said: "To allow operational flexibility, we opted for air-cooling as opposed to steam cooling as it means the gas turbine cooling system is decoupled from the water/steam cycle."

Flexibility is further increased in the design of the turbine, which features a compressor section that has four variable inlet guide vanes. The 50 Hz machine has 13 compressor stages operating at a pressure ratio of 19.2:1. The turbine section of the machine has four stages with air-cooled blades and vanes on the first three stages, and thermal barrier coatings on the first and second stages. Stage-four is un-cooled.

The gas turbine has demonstrated an impressive rated power output of 375 MW with an efficiency of 40 per cent. But apart from the gas turbine design, there were notable advances in the water/steam cycle that contributed to both plant efficiency and flexibility.

In the steam turbine, live steam conditions were increased to 600°C, 171 bar for the HP section and 600°C/35 bar for the IP section. Meanwhile, the LP turbine features a titanium last stage blade, claimed to be a first for steam turbine technology. These all contributed to an increase in overall combined cycle efficiency.

The heat recovery steam generator for Irsching 4 was specially designed and built by Siemens to not only handle higher steam flows, temperatures and pressures, but also to allow greater flexibility. Lothar Balling, Head of GT Power Plant Solutions within Siemens fossil power



**Irsching 4: setting new records for combined cycle power plants**

generation division said: "An essential element of power plant flexibility is the time taken for a hot start, which is typically required after 6-8 hours off line. Here we are able to demonstrate that thanks to our FACY (Fast Starting and Cycling) feature, the complete plant can be very reliably run up to full load in less than 30 minutes."

According to the company, the HRSG sets a new standard for size and performance. "The H-class HRSG is based on the proven Siemens Benson HRSG design but sets a new benchmark, exceeding the F-class technology in all aspects," said Balling. Compared to the F-class HRSG, the steam temperature and pressure are 35 per cent higher, while steam mass flow has been increased by 30 per cent.

The new benchmark for performance and flexibility has put Siemens at the forefront of combined cycle technology but it will not be long before it has commercial competition.

Late last month GE Energy announced what it is calling the 'FlexEfficiency 50' combined cycle power plant. Rated at 510 MW, GE says this "first-of-its-kind power plant" is engineered to deliver an unprecedented combination of flexibility and a fuel efficiency of greater than 61 per cent.

This plant is also designed to respond to fluctuations in wind and solar power, thus enabling the integration of more renewable resources into the power grid.

According to GE, the plant is the result of an investment of more than \$500 million in research and development, which began 6-7 years ago.

Paul Browning, vice president, thermal products for GE Power and Water said: "For years we have been working to develop technology that can, in the same breath, deliver breakthrough efficiency and deal head-on with the challenge of grid variability caused by wind and solar. The need for combined flexibility and efficiency is even more pressing today as countries around the world establish new emissions standards."

GE says it has drawn from its jet engine expertise to engineer a plant that will ramp up at a rate of more than 50 MW per minute, "twice the rate of today's industry benchmarks".

At the heart of the new plant will be what GE is designating as the 9FB.05 gas turbine. It has a new 14-stage compressor that is a scaled version of the 7FA.05, providing a 19.6:1 compression ratio. It also features a 4-stage turbine, new sealing technology to reduce losses caused by air leakage, and turbine inlet temperature in the 1500°C class.

This all adds up to deliver a designed power output of 338 MW and a simple cycle efficiency of better than 40 per cent, according to GE.

To improve flexibility, the compressor includes four variable guide vanes. The steam turbine is also fitted with a clutch

that allows the bottoming cycle to be disconnected from the topping cycle to allow a faster plant startup. GE says the plant will be capable of reaching full rated capacity in 28 minutes.

However, it stresses that it is the use of aircraft technology throughout the plant that has made the most important contribution to flexibility. Browning explained: "We've adopted some new aviation technology. GE has used nickel-based superalloys in some structural components for a long while and we have now developed these to the point where we can fully utilise their capabilities to deliver this combination of efficiency and flexibility. We've used aviation design methods and tools along with aviation alloys to provide aviation levels of flexibility."

Aviation technology has also been used in the plant control systems. "We've adopted the same kind of aviation technology that is used to provide hover capability and re-directed thrust in the Harrier Jet and the Joint Strike Fighter. The adaptive control technology brings new levels of flexibility not just to the gas turbine but to the entire power plant," noted Browning.

According to GE the plant can be turned down to less than 40 per cent of maximum rated load while the gas turbine itself can operate at less than 30 per cent of its rated power output, while maintaining emissions compliance.

Browning added: "We will achieve 50mg/Nm<sup>3</sup> NO<sub>x</sub> and 30 mg/Nm<sup>3</sup> CO, and we will maintain this emissions compliance even when ramping at 51 MW/min."

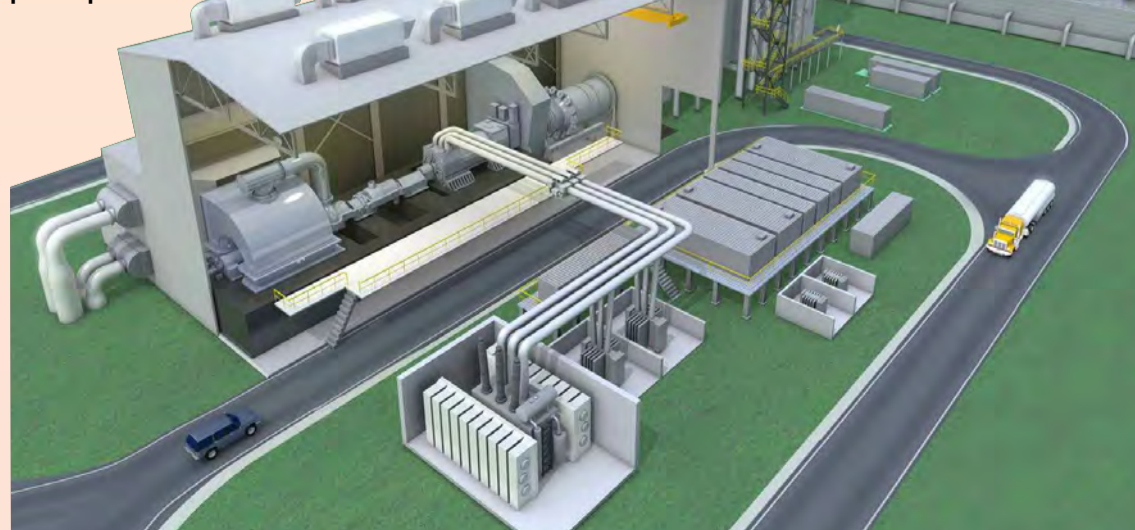
The FlexEfficiency 50 plant is the first product in what GE says will be a new FlexEfficiency portfolio. There are plans to introduce a 60 Hz version in the future but for now the focus is on getting the first product ready for commercial introduction. The compressor is now being tested at GE's Greenville facility in the US, with full load, full speed tests scheduled for 2014.

The first FlexEfficiency 50 unit is scheduled to be shipped in 2014 for an expected start-up in 2015. "We are finalising commercial discussions with customers – IPPs, utilities and some other partners – in four countries. We've seen quite a bit of interest so we are expecting a pretty rapid market introduction."

Indeed the market will be very interesting in 3-4 years time. GE will have a flexible combined cycle plant with an efficiency of better than 61 per cent. Meanwhile, Siemens does not plan to stand still. It expects to increase output from the SCC5-8000H to more than 600 MW and push efficiency to more than 61.5 per cent by 2015.

As the power generation market once again turns to gas, no doubt there will be other major gas turbine combined cycle technology announcements in the not too distant future.

**Artist impression of the FlexEfficiency 50 power plant**





Junior Isles

# Renewable dreams

“The former German Chancellor Helmut Schmidt once said, ‘if you have a vision, go see the doctor’. EREC has a vision of renewables providing 100 per cent of the EU’s energy by 2050.” Josche Muth, Deputy Secretary General of the European Renewable Energy Council, who was speaking at EREC’s biannual policy conference (EREC 2011) added that he hoped to achieve that vision without the need of a doctor.

To turn its vision into reality, EREC believes the EU has to be even more ambitious on targets. The Council used the occasion of its biannual policy conference to call for a legally binding renewable energy target of 45 per cent of final energy consumption in the EU by 2030. It said that this was needed for the EU to deliver on its commitment to reduce greenhouse gas emissions by 80-95 per cent by 2050 [compared to 1990 levels].

EREC’s President, Professor Arthouros Zervos said: “Strong words demand strong action. There is a far-reaching agreement that Europe’s energy system must undergo radical change. With today’s policies, however, the EU is set to fail to meet its long-term climate ambition. We need a legally binding target for renewables of 45 per cent by 2030 as this would give a clear signal to investors and unlock crucial private investment.”

Claude Tumes, Member of the European Parliament and President of EUFORES (also referred to as ‘Mr Renewables’), said, somewhat more fervently, that it was time for action. “National Action Plans are in, they have been analysed and now we need action. We need action by the European Commission. There are some Action Plans that need an infringement procedure so the Commission needs to get its act together. Drawing plans is nice but as in rugby it’s not enough to be close to the line. You have to do the touchdown.”

If Tumes were a rugby player, however, he would surely know that making the touchdown is often the hardest part.

As the EU moves to increase the use of renewables in an effort to meet climate change goals, it is safe to say that the share of renewables will increase substantially in any future scenario. However, a 100 per cent renewables vision is fraught with problems.

Philip Lowe, European Commission Director General for Energy was careful to point out that EU policy is more than just renewables. “Energy policy is not strictly about renewable energy or climate change. It is vital to incorporate security of supply and whether our industries and services have an affordable base of energy for the future.”

Indeed security of electricity supply and price are two major issues. Professor Zervos said that of all the targets that would be set for the various sectors contributing to its call to reach 45 per cent of renewables by 2030, the target for electricity would be the easiest because the

electricity sector “has taken off already”. According to EREC, 35 per cent of generation would come from renewables by 2020. Under a “Baseline scenario” in a recent EREC report, renewables would account for 57 per cent of electricity demand by 2030.

In all of the International Energy Agency’s (IEA) future scenarios, electricity from renewables makes a vital contribution. “In its WEO 2010 the share of renewables in electricity generation rises to 23 per cent by 2035 in the current policy scenario, 32 per cent in the new policy scenario and to 45 per cent in the 450 ppm scenario – the CO<sub>2</sub> limit to avoid a 2°C increase in global temperature,” said Richard Jones, IEA Deputy Executive Director.

**We need action by the European Commission... Drawing plans is nice but as in rugby, it’s not enough to be close to the line you have to do the touchdown**

Under the IEA’s most ambitious scenario (the 450 ppm scenario) in the EU, the share of variable renewables such as wind, tidal and solar, rises from just 4 per cent to nearly 30 per cent by 2035.

Such a huge increase brings technical challenges. The IEA used the occasion of the conference to launch a book called *Harnessing Variable Renewables: a Guide to the Balancing Challenge*. The IEA stressed that it is of critical importance to make progress in this area if there is to be a large increase in Europe.

On the issue of cost, Tumes was quite vocal. “A lot of the argument surrounding renewables is related to cost. You often hear that renewable [generation] is too expensive. But if you look at the arguments more closely, it is nonsense to look at the cost of an individual technology and not look at the systems as a whole.”

He said that he has seen very little

study from either the Commission or from governments that take into full account and integrate into their cost structure, the merit order effect. “When the wind blows or the sun shines, the cost of electricity in the wholesale market goes down. If this effect is taken into account in a system approach... wind would be seen as the cheapest option of all in bringing electricity costs down.

“Second we are really comparing apples with pears. How can you dare to compare an old nuclear plant that was financed in monopolistic times with a new renewable investment? We are comparing costs in a system that historically never integrated the reality of the costs.” He also said the cost of decommissioning and risks associated with nuclear should be

taken into account.

Tumes also questioned the true price of electricity from coal fired generation, commenting: “Should the price be reflected at a CO<sub>2</sub> price of €15 per tonne? The ETS would need to go up to €80-100 to show the real cost per kWh.”

Tumes was highly critical of UK energy policy and its potential knock-on effect on the EU. “The UK approach to energy policy is a narrow economic view. The economist behind the UK Electricity Market Reform is Dieter Helm, one of the most narrow-minded economists. And the European Commission has nominated Mr Helm to chair the EU advisory group charged with putting together the 2050 roadmap.”

He said that worryingly, studies by the UK government and Eurelectric show a much slower growth in power generation from renewables beyond 2020. Tumes believes this is now

being reflected in statements by European Energy Commissioner Gunther Oettinger.

The EC will be looking at the various scenarios for the decarbonisation of energy in a roadmap, which it expects to publish in October this year. Tom Howes, Deputy Head of Unit, Directorate-General for Energy, European Commission gave an insight into the EU’s thinking on decarbonisation through 2050. He said the biggest reduction would come from the power sector, which would achieve a 54-68 per cent reduction in CO<sub>2</sub> by 2030 and 85-95 per cent by 2050.

One of the debates between now and the publishing of the roadmap will be whether the EU should set new 2030 targets in order to achieve the 2050 targets for CO<sub>2</sub> reduction.

Tumes and others were not sure if this is something that countries should push for. Instead he felt the focus should be first on achieving the 2020 targets. “If we go for a 2030 target it would mean the share of renewables for electricity generation going from 18 per cent between 2010 and 2020 to 35 per cent in 2030.”

There are many questions relating to the EU’s long-term strategy for increasing renewables. Lowe noted: “If one is talking beyond 2020 about a much higher share of renewables, one can ask a series of questions long-term about whether the location of some of the investments in renewables should be looked at more on a wider basis than a national level to achieve some degree of comparative advantage in the local weather conditions that determine whether solar or wind is going to be profitable and sustainable.”

If the vision is 100 per cent renewables, arguably it does not matter where they are located – although EREC should keep in mind that if the industry is not careful the final ‘doctor’s bill’ could perhaps be much higher than necessary.

