

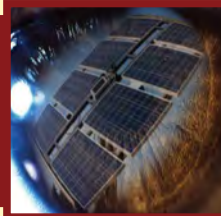
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# Moves for greater cooperation in run-up to Mexico

Gary Locke:  
United States  
Commerce  
Secretary

Although many are sceptical that any legally binding agreement on climate change will be reached in Mexico this year, both the US and the EU are moving closer to China on clean energy development, writes Junior Isles

Recent visits by high level US and EU delegations to China may be significant in tackling climate change, especially if a global agreement is not reached later this year.

Last month United States Commerce Secretary Gary Locke led a US trade delegation to China saying that the primary focus of his trade mission was clean energy.

The mission members were scheduled to have 75 one-on-one business meetings during their stay to expand business in Hong Kong, the Pearl River Delta Region and

other places across China.

Locke said energy worldwide was a \$6 trillion market, and the fastest-growing sector "was of the cleaner, greener kind".

He added: "New energy has to be clean to avoid catastrophic climate change, and it has to be cheap to keep economies growing."

Chinese Vice Premier Li Keqiang noted: "As major energy producers and consumers, China and the United States can work together extensively in the clean energy field."

The driving force behind

cooperation, Li said, lies in the fact that China is actively pushing ahead with clean energy projects while the United States has green energy expertise and technology.

Li encouraged the two countries to work more closely in clean energy, greenhouse gas emissions reduction and technology development to add to the momentum of sustainable development.

The trade mission included 24 US companies representing a variety of different sectors, which according to Locke "represent the best the United

States has to offer in terms of clean energy, energy efficiency, electricity generation and distribution". The trade mission, the first one led by a US cabinet-level official since Barack Obama assumed the presidency, included leading energy companies like General Electric and First Solar as well as less well-known companies.

The trade mission laid the foundation for a visit by US Energy Secretary Steven Chu, which was scheduled for the end of May.

*Continued on page 2*

# Nuclear deal may re-ignite non-proliferation debate

China National Nuclear Corporation's (CNNC) decision to build two more nuclear reactors in Pakistan may re-ignite the debate about nuclear commerce and proliferation.

Under the agreement, Chinese companies will build at least two new 650 MW nuclear reactors at Chashma in Punjab province.

CNNC said the two governments had signed an agreement for the provision of a Chinese loan for the construction of the reactors, Chashma 3 and 4, on February 12 and that it went into effect in March. At the end of April, in a confirmation in China's *Global Times*, the Chinese Foreign

Ministry reported that "Chinese and Pakistani officials have signed an agreement to finance the construction of two nuclear reactors, to be built in Pakistan by Chinese firms".

Jiang Yu, a spokeswoman for the Chinese Foreign Ministry, said that the nuclear deal conforms to international standards set by the International Atomic Energy Agency (IAEA).

According to observers, the deal poses a dilemma for Barack Obama's US administration, which wants support for Chinese sanctions against Iran but does not want to weaken the nuclear non-proliferation treaty. China began building a reactor at

Chashma in 1991. Work on a second project began in 2005. Both projects were agreed before the safeguards of the Nuclear Suppliers Group (NSG) which imposes restrictions on the supply of civilian nuclear equipment and technology to countries such as Pakistan that have not signed the Nuclear Non-Proliferation Treaty (NPT).

Shen Dingli, Executive Deputy President at the Institute of International Studies at Fudan University, was quoted as saying: "Beijing and Islamabad had started joint civilian nuclear projects before China joined the NSG in 2004, which means the mutual cooperation is

legal. Washington can't find reasons to criticise Sino-Pakistani nuclear cooperation."

So far Washington has remained silent on the deal.

Speaking to the *Financial Times*, Mark Hibbs of the Carnegie Endowment for International Peace said the Obama administration could well not oppose the deal because it wants to keep Pakistan engaged in Afghanistan and gain Chinese support over Iran's nuclear programme. He also said the US would find it difficult to oppose China's support for Pakistan after signing the US-India civil nuclear agreement.

*(Continued from page 1)*

Chu has been seeking to actively engage China since coming into office. At the end of March, he announced the availability of \$37.5 million in US funding over the next five years to support the US-China Clean Energy Research Centre.

Speaking at the International Cooperative Conference on Green Economy and Climate Change in May, Vice Premier Li said that developed nations should assist the developing world in its green economy endeavour by technology transfer, financial assistance and market liberalisation.

At the end of April, China and the EU inaugurated a new cooperative project on clean energy, in a further effort to jointly tackle energy efficiency and climate change.

European Commission President Jose Manuel Barroso and Zhang Guobao, head of China's National Energy Administration, witnessed the inauguration of the Europe-China Clean Energy Centre based in Tsinghua University.

The centre will act as a platform to provide support for both Chinese and European energy sector key players, and its objective is to promote increased use of clean energy.

Barroso said the launching of the centre was another flagship in the EU's cooperation with China and represents a major step in common efforts to shape a more sustainable, environmentally friendly and efficient energy sector.

"The European Union cannot achieve its energy and climate change objectives alone. We want to make partnership with friends around the world... There are now very important prospects for developing many concrete projects within China and the European Union," Barroso said.

Practical projects such as these will be especially important in building closer ties between the major polluters ahead of the upcoming climate change meeting to be held in Mexico at the end of this year.

Many remain sceptical that an agreement will be reached. India recently said it has low expectations of reaching a global agreement when world leaders meet later this year.

"We've reached virtually a dead-end," Environment Minister Jairam Ramesh told the media in Beijing. "The prospect of a breakthrough is very, very remote. There's no silver lining. At the most, there'll be a political statement."

EU Climate Commissioner Connie Hedegaard said the EU will push for agreement this year on specific items to put into a global climate treaty without trying to reach a binding accord until 2011.

Hedegaard told *The Associated Press* such a strategy could prevent the next climate summit in Cancun, Mexico in December from becoming "hostage" to the stalemate over how to fashion a legal framework.

Hedegaard is also seeking to open a debate ahead of Cancun on whether the bloc should adopt a tougher target than it already has for reducing greenhouse gas emissions.

# Germany turning to gas and renewables

A number of companies are turning away from investing in coal fired generation in Germany, as gas and renewables are expected to play a bigger role in the generation mix. **Junior Isles**

Stadtwerke Dusseldorf's (SWD) decision to abandon its plans for a 400 MW coal-fired power plant unit is part of a growing trend among energy companies operating in Germany.

Citing various planning, economic and environmental reasons, the municipal utility has instead decided to invest in both a combined heat and power (CHP) gas-fired unit and several renewable technologies such as wind and solar power, biomass and biogas.

This intention to turn away from coal was announced just as several other companies – namely GDF Suez, E.On, Group E and Romande – pulled out of their planned investments in coal-fired power plants across Germany.

Industry analyst Datamonitor said as gas becomes cheaper and the Nordstream pipeline comes online, the German power industry is likely to increasingly rely on gas imports as its key fuel source, in the short to

medium term at least.

With gas prices trading at low levels and Nordstream (a new strategic gas pipeline project that will bring in 55 billion m<sup>3</sup> of gas per annum from Russia) already under construction, SWD's move reinforces the fact that coal's long-term viability as a source of baseload power supply in Germany is questionable, said Datamonitor.

Planning and development costs, challenging environmental legislation, negative public opinion, uncertainty over carbon prices and the future of carbon capture and storage (CCS) technology seem to suggest that it is unlikely that coal will remain the fuel of choice in Germany over the longer term, it added.

Given that coal is currently responsible for almost half of Germany's power generation, it would seem likely that gas and renewable power will play an increasingly large role, particularly if nuclear power plant licenses are not extended.



Utility owners are putting greater focus on high efficiency combined cycle plants that have improved operational flexibility.

Notably, after around two years of construction, last month the Irsching 5 combined cycle power plant near Ingolstadt was put into operation in an official ceremony. The owner of the new plant is GKI (Gemeinschaftskraftwerke Irsching GmbH), a project company consisting of E.On Kraftwerke GmbH, N-Ergie AG, Mainova AG and Heag Südthessische Energie AG.

According to Siemens, which built the plant under a turnkey contract, the new 847 MW natural-gas-fired plant achieves an efficiency of more than 59.5 per cent.

"With its high efficiency level, and the associated extremely low emissions, along with its short start-up times, this plant sets new standards for this performance class," said Michael Suess, CEO of the Fossil

Power Generation Division of Siemens Energy.

However, depending on gas may present problems in parts of the country. In a recent statement E.On Ruhrgas, E.On's core natural gas business, said it faces "major challenges" in supplying its customers in Germany and Europe following a deal with the European Commission that settled an antitrust investigation against the German utility.

The commission earlier said it has closed its antitrust investigation over alleged anti-competitive behaviour after Ruhrgas agreed to make available import pipeline capacity to competitors to simplify market access in Germany.

E.On Ruhrgas said it needs significant import capacity to safeguard long-term gas supply contracts with major gas producers.

The company added, however, that it "can supplement the long-term import bookings with additional short-term bookings".

## BG Group exiting generation

With the sale of its US generators complete, barring regulatory sign-off, and a sale process under way for its remaining UK generation assets, BG Group is pulling the plug on its involvement in power generation.

Falling electricity demand in the US and UK is forcing the company to sell its assets to allow greater focus on what it sees as other areas of growth.

The capital raised from the sale of generation assets will be put towards the group's planned capital investments of \$7.5 billion for 2010, which are intended mainly for unconventional gas and LNG in Australia, and exploration and production activity in Brazil.

BG Group has suffered a loss on the sale of its US generation assets. It paid \$925 million for 1244 MW of gas-fired generation capacity in the US New England region during 2006 and 2007. The subsequent sale price of \$450 million to Energy Capital Partners reflects the flagging wholesale generation prices in the US power market since the highs of 2008.

In the UK, BG Group has sold its 50 per cent interest in the 1140 MW Seabank power plant near Bristol to Electricity First (owned by the Hong Kong-based Cheung Kong Infrastructure) for £211.7 million (\$316 million).

## US grid can accommodate large increase in wind and solar

- Possible to incorporate 35 per cent without backup
- Utilities have to increase their coordination

The National Renewable Energy Laboratory (NREL) in the US has released its 'Western Wind and Solar Integration Study', which examines the benefits and challenges of integrating enough wind and solar energy capacity into the grid to produce 35 per cent of its electricity by 2017.

The study claims that such a target is technically feasible and does not necessitate extensive additional infrastructure, but does require key changes to current operational practice.

"If key changes can be made to standard operating procedures, our research shows that large amounts of wind and solar can be incorporated onto the grid without a lot of backup generation," said Dr. Debra Lew, NREL project manager for the study. "When you coordinate the operations between utilities across a large geographic area, you decrease the effect of the variability of wind and solar energy sources, mitigating the unpredictability of Mother Nature."

Though wind and solar output vary

over time, the technical analysis performed in this study shows that it is operationally possible to accommodate 30 per cent wind and 5 per cent solar energy penetration. To accomplish such an increase, utilities will have to substantially increase their coordination of operations over wider geographic areas and schedule their generation deliveries, or sales, on a more frequent basis.

Currently generators provide a schedule for a specific amount of power they will provide in the next hour. More frequent scheduling would allow generators to adjust that amount of power based on changes in system conditions such as increases or decreases in wind or solar generation.

The study was undertaken by a team of wind, solar and power systems experts across both the private and public sectors. The study complements the recently released 'Eastern Wind Integration and Transmission Study', which examines the feasibility of integrating up to 30 per cent wind in the eastern states.

## Rurelec battles on

Rurelec, the UK-based investor in South American power projects said it will continue to invest in Bolivia despite having its assets nationalised.

Bolivian President Evo Morales nationalised three power companies with foreign capital and a local electricity cooperative last month.

The nationalised power companies were Corani, which was 50 per cent owned by Ecoenergy International, a unit of France's GDF Suez; Guaracachi, 50 per cent owned by Rurelec; and Valle Hermoso, half of whose shares were held by the Bolivian Generating Group, a unit of investment firm Panamerican de Bolivia. In each case, the government had held the other 50 per cent stake in the companies.

Morales said that state-owned power company ENDE will now control 80 per cent of Bolivia's electricity generation.

Peter Earl, Rurelec's chief executive said the government's decision has damaged neither his confidence nor interest in the Bolivian market.

Earl told the *Financial Times*: "I am really upset. The general director and finance director [of the subsidiary] were escorted from the office at gunpoint. But Bolivia needs power and we have been the market leader since privatisation in 1994. If we get the compensation we are due and in reasonable time, we would invest at least part of it back into Bolivia."

Rurelec estimates that its stake in Guaracachi to be worth about \$70 million.

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# American Power Act unveiled

The recent oil spill in the Gulf of Mexico has heightened energy policy debate in the USA, but may not be enough to push through climate change legislation, writes Sian Crampsie.

The drive to enact climate change legislation has once again started in the US with the unveiling last month of a draft bill by two Senators.

The American Power Act – authored by Senator John Kerry (D-MA) and Joe Lieberman (I-CT) – aims to boost the country's energy independence, reduce greenhouse gas emissions and launch an industry focused around clean energy technologies.

A key provision of the proposed bill is financial incentives for the construction of new nuclear plants, but this has angered environmental groups as well as sparked a row within the nuclear industry over the issue of waste storage.

The bill also aims to protect states against oil spills, including one that allows states to veto offshore drilling plans if they stand to suffer significant adverse impacts in the event of an accident.

APA sets a target of reducing carbon emissions by 17 per cent by 2020 and by over 80 per cent by 2050. It sets out a cap-and-trade system to achieve these reductions but only 7500 large industrial facilities and power plants will participate.

It also sets out introductory floor and ceiling prices for carbon allowances, starting at \$12/ton and \$25/ton, respectively, and rising in line with inflation.

The bill has been largely welcomed by key players in the country's electricity industry, many of whom say that they need certainty in climate change policy and carbon prices in order to make planned investments.

Research from Norwegian analysts Point Carbon shows that the price for each metric tonne of carbon dioxide equivalent (CO<sub>2</sub>e) would average \$26 over the period 2013-2020 under the cap-and-trade programme proposed in APA.

"PSEG is ready to make significant investments that would help combat climate change, but we need the regulatory certainty that the passage of this legislation would provide," said Ralph Izzo, Chairman of energy utility PSEG. "There are three key issues we believe are critical to success – and from what I understand, the legislation gets these critical issues right."

The "critical issues" according to Izzo are the creation of a single, national approach to climate change, minimising the impact of clean energy investments on consumers and reducing risks with a price collar.

The price collar proposed in the legislation will succeed in reining in allowance prices, says Point Carbon. "Allowances would cost considerably more if the price was determined purely by supply and demand, particularly after the industrial sector

enters the system in 2016," said the Norway-based firm in a statement.

According to Point Carbon, the volume of allowances capped would be 2.5 billion tons of CO<sub>2</sub>e in 2013 when only the power sector is covered, increasing to approximately 4 billion tons in 2016.

But in spite of support from the industrial sector and from energy companies such as FPL Group and Duke Energy, APA will face a rocky ride in the Senate, particularly as it adopts a cap-and-trade approach that mirrors the bill that was passed by the lower house last year.

The proposed bill could fail to win the support of Republicans following the withdrawal of Senator Lindsey Graham (R-SC) from the legislative effort in April. Some Democrats will oppose the bill, particularly those from industrial states that see it as a tax on local businesses.

Climate change is a top priority for the Obama administration, as is nuclear energy. President Barack Obama is to ask Congress to agree to \$9 billion more in loan guarantees for the nuclear energy industry and the Department of Energy recently announced a \$2 billion loan guarantee for Areva to support the construction of a uranium enrichment plant in Idaho.

The APA bill proposes a broad package of financial incentives to



Aiming for energy independence: Senator John Kerry

increase nuclear power generation but fails to resolve the issue of waste in spite of President Obama's recent decision to cancel the Yucca Mountain repository project. In April, 16 US utilities and the Nuclear Energy Institute (NEI) filed a lawsuit against the US government seeking suspension of a fee that they pay to fund the development of federal nuclear waste facilities.

The NEI has praised the APA legislation for its nuclear energy provisions, which include regulatory risk insurance for 12 projects, accelerated depreciation for nuclear plants, a new investment tax credit to promote the construction of new generating facilities, \$54 billion in loan guarantees and a manufacturing tax credit to spur the domestic production of nuclear parts.

## Mexico mulls nuclear

Mexico is to investigate the possibility of expanding its nuclear power sector as a means of attaining greenhouse gas emission targets.

The head of the Energy Secretariat, known as Sener, has said that the government is to analyse the opportunity cost and future prices of new nuclear build.

Mexico has set a target of producing 35 per cent of its electricity from "clean" sources and would also expand the wind energy sector alongside nuclear energy.

Mexico's electricity sector is heavily reliant on thermal sources of energy – mostly natural gas and coal – and is controlled by the Federal Electricity Commission (CFE). It operates one nuclear power plant with a capacity of 1300 MW that produces five per cent of electricity in the country.

According to the World Nuclear Association (WNA), CFE has studied four scenarios for new power generation capacity between 2019 and 2028, including one with a heavy reliance on coal and one with investment in nuclear and wind power capacity.

The most aggressive scenario proposes the construction of ten nuclear power plants so that nuclear energy accounts for 25 per cent of electricity needs in 2028, says WNA. The country is also thought to be considering the construction of small nuclear reactors such as IRIS.

## Brazil boosts wind power

- 478 projects to be auctioned
- Iberdrola outlines investments

Lighting up with renewables



Brazil is planning a major expansion of renewable energy through an auction to be held in the next few weeks.

According to the state-owned energy research corporation, EPE, the government is to put 399 wind farm projects and 79 other renewable energy projects up for bidding. The auction forms part of Brazil's 2010-2019 ten-year plan, which aims to prioritise the expansion of the

renewable energy sector.

If implemented, the projects to be auctioned will add 14.5 GW to the country's installed capacity. The wind farms alone would add 10.5 GW to the grid – almost all of it in the northeast of the country.

Other projects up for auction are 61 biomass projects with a combined capacity of 3706 MW, and 18 small hydropower projects that would add 255 MW to the grid. Most of the

projects should be on-line by 2013.

Spanish firm Iberdrola recently outlined plans to invest \$1.13 billion in Brazil over the next three years, and says it is targeting Brazil because of its strong economic growth rate and investment opportunities. The firm plans to invest in the electricity network as well as in the construction of new hydropower capacity through its local subsidiary Neoenergia.

## Offshore wind approved

Renewable energy groups are applauding the approval by the Obama Administration of the USA's first offshore wind energy plant in Nantucket Sound, Massachusetts.

The project has also received approval from the Federal Aviation Authority (FAA) and its developer, Cape Wind, has reached agreement with National Grid over the sale of power from the wind farm.

The Cape Wind project will involve the construction of 130 wind turbines producing 430 MW of energy and was approved by US Secretary of the Interior Ken Salazar at the end of April in spite of fierce opposition from some locals. The approval is likely to trigger approvals for six more offshore projects along the east coast of the USA.

Cape Wind President Jim Gordon said that Salazar's decision had "launched the American offshore wind industry" and would allow the country to "harness an abundant and inexhaustible clean energy source for greater energy independence, a healthier environment and green jobs".

His sentiments were echoed by the European Wind Energy Association, which said that the project marked the birth of a new phase in offshore wind power.

According to Cape Wind and National Grid, the wind project will typically add \$1.59/month to household electricity bills and will bring other benefits such as new jobs and reduced reliance on fossil fuels.

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# Tight gas supply compounds power problems

Indonesia is facing a gas supply deficit that is affecting its effort to eliminate power shortages. State owned electricity company, PLN, said an inadequate gas infrastructure means it will face a gas supply deficit for its gas fired power plants until next year.

A pipeline and floating receiving terminal is planned to transport gas from Kalimantan to Java but the facilities would be insufficient and distribution pipes are still needed to bring the gas to the end users, said Nur Pamudji, the primary energy director of PLN.

"If we ask for supply from Total EP, they say okay but [it's] how to channel

the gas? PLN, therefore, has to buy oil fuel [of] which it will need 7.6 million litres per year," he said.

The government also plans to form a road map to develop coal-bed methane-based power plants. Indonesia is known for its high potential of coal-bed methane with almost 460 trillion cubic feet. The government will start building a 23 MW power plant next year that runs on coal-bed methane.

Indonesia is facing power shortages, which may see rotating blackouts throughout the country starting this month, according to Coordinating Minister for the Economy, Hatta Radjasa.



The government's mid-term target is to overcome power shortages by 2012-2013. Indonesia therefore aims to increase its electricity capacity by 15 000 MW this year to support its economic growth target of 7 per cent by 2014.

In an effort to promote the use of its considerable geothermal resources, the country recently said it plans to eliminate the existing limit on prices that the state utility company can pay to independent power producers (IPPs).

Under the plan, IPPs would submit a power-price bid during the development tender process, with PLN being forced to accept the lowest bid.

However, if PLN insists the price is too high, the plan has provisions for a new price to be negotiated between the producer and a new agency to be established by the government, with the

government subsidising the difference between the current price ceiling of 9.7 cents/kWh and what the producer is willing to accept.

At the end of April, the government also said it would increase electricity rates across the board by 10 per cent after the parliament agreed to increase the electricity subsidy in the 2010 budget by 2 trillion rupiah (about \$222 million).

Speaking to the *Jakarta Globe*, Hatta said: "With the additional subsidy, the average increase of electricity tariffs will be 10 per cent instead of 15 per cent," referring to the government's initial rate increase proposal that was widely opposed. The electricity rate hike is proposed to take effect next month (July).

The government is eager to reduce its massive subsidies for electricity and fuel, and has said they will both be eliminated by 2014.

## Aboitiz Power eyes coal

Aboitiz Power Corp. (AP) plans to expand its coal generation portfolio across the Philippines over the next five years.

In a briefing, Erramon Aboitiz, AP president and chief executive officer, said the company is planning nearly P72 billion (\$1.55 billion) in capital expenditures for its organic expansion. "The big projects we are looking at are coal plants," he said.

These projects include the deferred construction of a 300 MW generating facility in the Subic Freeport zone, the expansion of the 232 MW Steag coal plant at the Phividec Industrial Estate in Misamis Oriental, and the construction of a coal plant in Davao.

Should all of the projects come to fruition, Aboitiz said it would add 700 MW to its power generation portfolio, a large portion of which comprises renewable energy sources.

The company has yet to finalize the financing of the coal plants, but is looking at project financing. "The funding of that will be a combination of debt and equity," Aboitiz said.

AP is also keen on expanding the 700 MW Pagbilao coal plant in Quezon.

Coal is an important part of the Philippines' power expansion programme.

The Metrobank Group recently said it is looking at Bohol as a potential site for another coal-fired power plant. Construction of a \$450 million coal-fired power plant by the Alcantara-led group of Conal Holdings Corporation in Maasim, Sarangani is expected to start next month (July).

PNOC-Exploration Corp. is also pushing through with its \$5 billion coal mine-mouth power project in Isabela province after securing environmental clearance.

"Coal can be also a very responsible type of energy source if done properly. Our intention is clearly to be within the Clean Air Act and all the requirements set by the government," Aboitiz said.

## Taiwan looks offshore

The Taiwanese Ministry of Economic Affairs (MOEA) will propose incentives next month to encourage local firms to invest in offshore wind power generation.

Deputy Minister of Economic Affairs Huang Chung-chiou said: "Offshore wind generation should be given top priority," adding that the Taiwan Strait has very good locations for developing offshore wind power generation.

Yeh Hui-chin, chief of the Bureau of Energy under the MOEA said that offshore areas near central Taiwan's Changhua and Yunlin counties are suitable sites for developing wind power generation, and the MOEA will propose a plan in July to specify wind farm areas and the capacity needed.

According to the MOEA, Taiwan's wind power equipment manufacturing sector was worth NT\$4 billion (\$128 million) in 2009, with investment from 20 companies. The value of investment is expected to increase by more than NT\$1.5 billion per year from 2010.

Huang pointed out that the Teco Group, Formosa Heavy Industries Corp., Yuan Jun Fong, and Taiwan's China Steel are aggressively taking part in developing the wind power industry.

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# Asia goes on nuclear charm offensive

Countries in Asia are looking to win public favour in establishing their civil nuclear programmes.

Indonesia recently allocated 7 million rupiah (\$769 000) for a "nuclear power plant socialisation" programme to calm public fears concerning its plan to build a nuclear power plant.

Minister for Research and Technology Suharna Suryapranata told a parliamentary hearing: "The fund is ... a clear indication that the government is ready to move to seize the [nuclear] opportunity. But we have to know that the nuclear power plant needs a common commitment and we have to coordinate among stakeholders."

Hudi Hastowo, Head of the National Atomic Agency (BATAN) said that socialisation campaign is desperately needed as the public is still in fear of nuclear power following the Chernobyl disaster.

Malaysia also needs to win over the public after Malaysian environmentalists and opposition leaders slammed the government's plan to build a nuclear power plant. They called it a risky venture, saying the country has sufficient energy output to meet future needs.

Malaysia will join neighbouring Thailand and Vietnam, which have unveiled plans to operate their first nuclear power plants by 2020, while Indonesia plans to build its own on

Java island by 2015.

The opposition Democratic Action Party said there was no need for nuclear power because Malaysia has a 40 per cent energy reserve margin, double the government's target of 20 per cent reserves.

The Centre for Environment, Technology and Development, a Malaysian think-tank, warned that nuclear power was capital intensive and risky because it generates radioactive waste that has to be discarded.

The official news agency *Bernama* quoted Energy, Green Technology and Water Minister Peter Chin Fah Kui as saying that nuclear technology would be imported from South Korea, China,

France or Japan.

The government needs to get the final approval from the International Atomic Energy Agency before it can proceed, Chin added.

Meanwhile, Japan has launched its own charm offensive with India as it attempts to play a role in India's civil nuclear power programme.

At the end of April, Japanese Economy, Trade and Industry Minister Masayuki Naoshima visited New Delhi as part of efforts to have more Japanese companies involved in large-scale development projects on the back of strong economic growth in India.

After meeting with Deputy Chairman of India's Planning Commission, Montek Singh Ahluwalia, the two countries agreed to establish a joint working group to exchange information on their energy policies.

"I think it would be very useful (for India) to adopt Japanese technologies and expertise on atomic power generation," Naoshima told reporters after the meeting.

India is planning to construct 20 nuclear power plants by 2020.

## ADB funding will boost solar

The Asian Development Bank (ADB) is playing a key role in the deployment of solar power in Asia. A new Asia Solar Energy Initiative (ASEI) is expected to deliver some 3000 MW of solar power by 2012.

Last month the ADB provided \$2.25 billion in initial grant funding to the initiative, which aims to identify and develop large capacity solar projects. An additional investment of \$6.75 billion dollars by 2012 is also expected.

"With energy demand projected to almost double in the Asia and Pacific region by 2030, there is an urgent need for innovative ways to generate power while at the same time reducing greenhouse gas emissions," said ADB Managing Director General Rajat Nag at a press conference.

In addition to direct financing, ASEI will try to raise \$500 million to "buy down" the high costs of investing in solar energy, and exploit ways to attract private-sector investment.

The Solar Energy Forum within the framework of the initiative has also been established as an international knowledge-sharing platform, with its first conference scheduled for July 5-6 in the Philippine capital of Manila.

Environmentally sustainable growth is among the three agendas adopted by the ADB as its long-term strategy until 2020.

## China initiates power trading market

China's first multilateral power trading market in Inner Mongolia has gone into official operation after trial operation and simulation runs that lasted more than one year. The move is seen as a breakthrough in electricity price reform in China.

The multilateral power trading market involves the participation of power producers, power grid companies and power consumers in the North China area.

In multilateral power trading, the electricity price is negotiated by electricity sellers and buyers. The new pricing mechanism replaces the traditional government-capped pricing mechanism and brings power consumers together to form a market, breaking the monopoly of power grid companies in electricity purchase.

Meanwhile, China continued the transformation of its grid when the Nanjing-based Jiangning economic and technological development zone signed cooperation agreements with four domestic smart grid companies in late April.

It marks the start of the construction on the demonstration park, which is aimed at leading the transformation of the national power grid and guiding the development of the state-of-the-art smart grid and low-carbon economy in China.



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# Prosecutors target carousel fraud

■ German firms raided  
■ UK investigation continues

Germany has become the latest European country to target tax evasion linked to emissions trading.

German prosecutors have carried out raids on over 200 offices and homes as part of an investigation into a "carousel fraud" thought to be worth around €180 million.

The UK, France, Spain and the Netherlands embarked on similar investigations last year in an attempt to stamp out the practice. The latest raid in Germany – which has targeted 50 firms – may have tainted an estimated seven per cent of carbon trades in last year's \$125 billion market.

In May the UK authorities carried out raids on seven properties and found guns as well as large quantities of cash as part of an investigation into a £38 million carbon trading carousel fraud.

Carousel fraud – also known as missing trader fraud – can be committed on any goods but the

EU Emission Trading Scheme's carbon allowances are susceptible because they are high value, intangible and easily traded. The fraud occurs when emissions certificates are bought VAT-free from abroad and sold on along a chain of companies.

The last firm in the chain sells the certificate abroad, declares VAT and collects a reimbursement. Sellers within the chain share the income.

Earlier this year EU finance ministers approved a directive to clamp down on VAT fraud in carbon markets by allowing EU member states to shift taxes to the end user. Several countries – including the UK – have already removed VAT from carbon credits.

Offices raided by the German authorities at the end of April include those of Deutsche bank and RWE. Neither firm has been charged or is under suspicion of any wrongdoing.

## Poland examines AP1000 design

Poland is continuing to seek technology partners for its nuclear power programme that it hopes will reduce dependence on coal and improve energy security.

State-owned generator (PGE) has signed a memorandum of understanding (MOU) with Westinghouse Electric to study the feasibility of building new nuclear reactors in Poland based on the latter's AP1000 technology.

PGE is planning to build two new nuclear plants in Poland, each with a capacity of 3000 MW. It has already signed agreements with France's EDF, GE Hitachi and Japan on nuclear cooperation.

Westinghouse's AP1000 reactor design is the only Generation III+ reactor to have been certified by the US Nuclear Regulatory Commission. It has also been certified by the European Utility Requirements organisation.

Poland has Europe's largest reserves of coal and is dependent on coal for just under 95 per cent of its electricity generation. The need to reduce carbon emissions and meet rising energy demand led the government in 2005 to implement a nuclear power programme.

## Plants delayed in UK



Reduced demand for electricity has forced two UK utilities to delay plans for new power plants.

Both E.On and Scottish & Southern Energy (SSE) have said that economic conditions had suppressed industrial demand in particular. SSE's proposed combined cycle gas turbine (CCGT) plant at Baglan Bay in Wales will be delayed until 2015, while E.On has delayed plans for its Drakelow plant in Staffordshire.

SSE said in an announcement that the impact of the economic downturn on electricity demand would be temporary and that it had identified a number of other CCGT projects for development. It had been planning to commission the 800 MW Baglan Bay plant in two stages between 2013 and 2015.

Other potential CCGT projects identified by SSE include an 850 MW plant at Keadby and a 450 MW plant at Barking.

## Nuclear agendas suffer setback

Political divisions are threatening the revival of nuclear energy in several European countries and are making investors uneasy, writes Siân Crampsie.

German Chancellor Angela Merkel: lost majority



Disagreement at the heart of the UK's new coalition government over nuclear energy is threatening to undermine the country's ambition to revive its nuclear power industry.

The Conservative-Liberal Democrat coalition has released a document outlining key policy areas for the new government that shows the two parties' deep division on nuclear power.

The Conservatives are in favour of continuing to develop the previous Labour government's ambition to build a new fleet of new nuclear power plants; the Liberal Democrats remain opposed.

"We will implement a process allowing the Liberal Democrats to maintain their opposition to nuclear power while permitting the government to bring forward the National Planning Statement for ratification by Parliament so that new nuclear construction becomes possible," says the coalition document.

Specifically, a Liberal Democrat spokesman will speak against the planning statement, but Liberal Democrat members of parliament will abstain from the vote.

The coalition has agreed a number of measures on energy efficiency, renewable energy and low-carbon technologies, but the uncertain outlook for nuclear energy is likely to be of concern to potential investors.

EDF has announced major plans for the construction of new nuclear capacity in the UK, as has Horizon Nuclear Power – a joint venture between German firms RWE and E.On. Areva, Rolls-Royce and AMEC are among the other firms gearing up for new projects.

Elsewhere in Europe other political developments are affecting the nuclear industry.

In Germany, energy firms were hoping that plans to phase out nuclear power would be put on hold by Chancellor Angela Merkel. However Merkel has lost her majority in the country's upper chamber and is now unlikely to be able to extend the lifespan of Germany's nuclear reactors.

Extension of the lives of these plants would help Germany to meet its growing electricity demand and the utilities that own and operate them

have warned that electricity prices will rise rapidly if the reactors are closed.

In Sweden, meanwhile, plans to reverse a ban on new nuclear plant construction have been put on hold until next year due to upcoming elections.

In early 2009 the country's alliance government proposed a policy that would allow the construction of new nuclear capacity on the site of existing nuclear plants, a move designed to help improve energy security and combat climate change. The policy was to have taken effect in August but the government has decided to postpone it due to the September elections.

Nuclear energy has always been hotly debated in Sweden, which voted in a 1980 referendum to phase out the use of nuclear power. It has already closed two reactors at the Barseback plant, and its remaining ten reactors – located at three sites – supply roughly half of the country's electricity needs.

In October 2009 Vattenfall said it would build at least one new nuclear reactor in Sweden.

## UK to extend offshore wind sites

A number of key wind power developers in the UK received a boost last month with the announcement of plans to expand the size of a number of proposed offshore wind farms.

The Crown Estate, the UK government body responsible for managing the country's territorial waters, has given permission for the development of an additional 2 GW of capacity at five sites.

The sites are existing sites granted concessions under the UK's Round 1 and Round 2 offshore development process and it is hoped that extending them will help to fill the gap between commissioning of the last Round 2 site and the first Round 3 site.

"This 2 GW has been driven by developers' appetite and will increase the total potential 2020 installed capacity to 48 GW," said Rob Hastings, director of marine estate at the Crown Estate. "It is another positive step in the maturing of the offshore wind industry and will significantly support the growth of the supply chain as it adds further to the pipeline of construction projects."

Three developers – Dong Wind UK, Vattenfall Wind Power and a joint venture of SSE Renewables and RWE npower renewables – have been awarded extensions. They are expected to finalise agreements with the Crown Estate this month and then move forward to the consenting process.

Their projects include a 504 MW extension to the Greater Gabbard wind farm and a 750 MW extension to Dong's Walney project.

# Russia wins ownership deal for Turkish nuclear plant

■ First reactor on-line in 2016  
 ■ Obama revives 123 Agreement

Russia has finally clinched a deal to build, own and operate Turkey's first nuclear power plant after the two countries signed an agreement during a visit by Russian President Dmitry Medvedev to Ankara in May.

The landmark deal is for the construction of four VVER reactors at Akkuyu on Turkey's Mediterranean coast and marks the first time that Russia will own as well as build a reactor overseas.

It comes after the Turkish government in late 2009 cancelled a contract for Russia's AtomStroyExport to build the plant.

South Korean firms are reported to be preparing a bid to build another nuclear power plant in Turkey, this time at Sinop on the Black Sea coast.

Russian state nuclear company Rosatom will execute the 4 x 1200 MW Akkuyu project through a specially created subsidiary. Turkish state generation company Elektrik Uretim (EUAS) will provide the site for the reactors.

The Turkish Electricity Trade and Contract Corporation (TETAS) will purchase a fixed amount of the \$20 billion Akkuyu plant's output over the first 15 years of commercial operation.

The reported price agreed for the energy is US¢12.35/kWh.

The reactors are expected to enter service starting in 2016. Although the Rosatom subsidiary building the plant will initially be 100 per cent Russian-owned, Rosatom is expected to sell up to 49 per cent of the company to strategic investors.

Russia and Turkey signed a statement on the development of the Akkuyu project in January 2010. AtomStroyExport had participated in an international tender for the plant and was declared the winning bidder.

However, its contract was cancelled by Turkey because it had been the sole participant in the tender and because the price set in the bid was considered to be too high.



President Dmitry Medvedev in landmark deal

Both countries' parliaments must ratify the agreement.

Russia's nuclear sector received another boost in May with news that US President Barack Obama is planning to resubmit to Congress a cancelled nuclear power pact with Russia.

The nuclear power agreement – known as the 123 Agreement – was originally drawn up in 2008 and sent to Congress by then-President George W. Bush, but was later withdrawn after Russia invaded neighbouring country Georgia.

The revival of the pact – which would clear the way for extensive nuclear trade between the two countries – is an indication of warming relations between the US and Russia. President Obama has written to the US Congress noting Russia's cooperation with the US in pushing for sanctions against Iran's suspected nuclear weapons programme.

## Russia woos partners

Planned investment in the Russian energy sector is continuing to attract strategic partners to the country.

In May Siemens signed two strategic agreements with Russian energy firms, while just weeks earlier Italian Premier Silvio Berlusconi met with Russian Prime Minister Vladimir Putin to discuss cooperation in the energy sector.

Siemens is already active in Russia but has enhanced its position in the country's electricity sector with a strategic cooperation agreement with the Federal Grid Company (FGC) to install Siemens technologies on the grid as well as



Silvio Berlusconi: seeking energy cooperation

expand local production facilities.

It has also established a new joint venture with ZAO Iskra-Avigaz to manufacture gas pipeline compressors in Perm, Russia.

FGC owns Russia's 118 000 km long-distance power grid, and has announced plans to invest €12 billion in 2010-2012. The Russian pipeline compressor market is worth around €200 million in 2009, according to Siemens.

During the meeting between Berlusconi and Putin, the two heads signed an agreement on a joint study on nuclear fusion technology. A memorandum of understanding was also signed between ENI and Inter RAO UES on cooperation in the nuclear sector.

## China supports African hydro plants

Chinese firms are continuing to strengthen their links with African energy companies by supporting key infrastructure projects around the continent.

In May SinoHydro signed a \$400 million agreement with Zimbabwe to expand the Kariba hydropower plant, while the China Development Bank (CDB) committed \$1 billion to the development of the Kafue Gorge Lower (KGL) hydropower project in Zambia.

According to the Zimbabwe Power Company, SinoHydro will add two 150 MW units at the Kariba plant. The project will help to overcome power shortages that are threatening to undermine the stabilisation of the economy achieved under the power-sharing government.

SinoHydro has also been contracted to build the KGL project, which will have an output of up to 750 MW. Development of the \$1.5 billion project is scheduled to start in 2011, with completion in 2017.

KGL will be located in the Kafue Gorge, 65 km upstream of the confluence of the Kafue and Zambezi Rivers, and immediately downstream of the existing 900 MW Kafue Gorge Upper hydropower project.

## SA plans for the future

■ Wind lobby pushes for renewables  
 ■ Areva mulls 100 MW CSP



South Africa's clean energy lobby is pushing for greater use of renewable energy as the country debates the development of its electricity industry.

The South African government has embarked on the public consultation for its second integrated resource plan (IRP2), a process through which it will identify the country's long-term electricity demand and the supply mix that will meet it.

South Africa's use of renewable energy is modest but the country's wind energy association (SAWEA) has called for the government to set an ambitious 25 per cent target for renewable energy contribution by 2025.

In its submission to the IRP2, SAWEA says that its research shows that renewable energy could provide 100 TWh of electricity – equivalent to

25 per cent of consumption – by 2025. Around 80 per cent of this could be delivered by wind energy, says SAWEA.

The IRP2 will cover a 25-year period and is scheduled to be announced in September 2010.

South Africa's current renewable energy target is 10 TWh by 2013. The government is keen to support renewable energy development, as it believes that renewables can provide the least-cost solution in many cases, especially when social and environmental costs are included.

South Africa's main utility Eskom is planning to add around 40 GW of new capacity to the grid over the next 20 years in order to meet electricity demand, which has risen sharply with economic growth. Coal is likely to remain an important part of the energy

mix, although the future of nuclear energy in South Africa is uncertain after the government axed plans for new nuclear capacity at the end of 2008.

SAWEA argues in its submission that wind farms could provide South Africa with an average daily minimum output of 7000 MW. It has refuted claims that renewable energy is unreliable and says that modern wind forecasting technologies give system operators accurate and reliable forecasts.

Local reports indicate that Areva Solar is interested in building a 100 MW concentrated solar power (CSP) plant in South Africa within the next two years. The French engineering firm says that South Africa has strong solar resources, but investment decisions will depend on the outcome of the IRP2 process.

## Israel is slow on renewable development

Israel is aiming to boost its renewable energy output with solar power plants located on and around industrial land.

The country's Lands Authority and the Ministry of National Infrastructures are preparing to tender land for the construction of solar energy installations, mostly in Negev. The tenders are for ten sites of 25-50 acres each and are intended for the development of grid-connected photovoltaic plants.

In May Israel's Public Utilities Authority said that only 22 MW of renewable energy facilities exist in the country. The government has a target of installing 1500 MW of renewable capacity by 2014.

Israel's Renewable Energy Association has labelled that lack of renewable energy development "a national failure".



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# Mitsubishi hits back against GE wind turbine claims

Mitsubishi is still hoping to gain ground in the US wind turbine market after a difficult two years, writes Siân Crampsie.

A long-running dispute between GE and Mitsubishi over wind turbine technology looks set to continue after the Japanese firm filed a lawsuit against its American competitor.

In an antitrust lawsuit filed in a federal court in Arkansas, Mitsubishi Heavy Industries (MHI) and Mitsubishi Power Systems Americas (MPSA) have accused GE of monopolising part of the US wind

turbine market and using patent-infringement lawsuits as a marketing tool.

Mitsubishi says that after it gained a foothold in the US market for variable speed wind turbines in 2006, "GE embarked on an unlawful anticompetitive scheme to drive Mitsubishi suppliers out of the US market". It has also filed a second suit in a Florida court, and is seeking

damages that it expects to be "in the hundreds of millions of dollars and probably be in excess of a billion".

The lawsuits from Mitsubishi follow complaints from GE that Mitsubishi violated GE patents for variable speed wind turbines. The US International Trade Commission rejected one GE claim earlier this year.

GE has since filed a second patent infringement suit in a federal court in

Dallas. It has rejected Mitsubishi's latest claims and says that its conduct has been appropriate at all times.

Mitsubishi's complaint alleges that GE used the lawsuits as a marketing tool, deterring customers from purchasing variable speed turbines from Mitsubishi. It has also charged GE with infringing a key Mitsubishi patent for variable speed wind turbines.

"GE brought these meritless claims against Mitsubishi and frightened potential wind turbine purchasers from purchasing Mitsubishi's turbines, preventing Mitsubishi's entry into the US market," said Mitsubishi spokesperson Sonia Williams. "GE's scheme has worked, to the disadvantage of competition and Mitsubishi's innovative variable speed turbines."

Since GE embarked on litigation over two years ago, MPSA has not sold any variable speed wind turbines in the USA, says Mitsubishi. Its sales prior to that were around \$2 billion per year.

Like most wind turbine manufacturers, Mitsubishi views the USA as a key market and is planning to build a wind turbine manufacturing plant in Arkansas, with production starting in 2011.

GE launched its first lawsuit against Mitsubishi in February 2008, claiming that Mitsubishi's 2.4 MW wind turbine infringed three of GE's patents, including one relating to a system that helps wind turbines to stay grid connected even if voltage is zero. After losing on these claims before the US International Trade Commission, GE filed a new lawsuit against Mitsubishi, alleging infringement of two other GE patents not mentioned in the first suit.

In a statement Mitsubishi said that "GE's new lawsuit prolonged the period of uncertainty over Mitsubishi wind turbines in the US market".

## Alstom moves into solar market

Alstom is making its first foray into the solar energy market with the acquisition of a stake in BrightSource Energy Inc., a US developer of concentrating solar power (CSP) technology.

The European technology company has made a \$55 million equity investment in BrightSource, making it a main shareholder in the firm. BrightSource already has operations in the USA, Israel and Australia.

Alstom Power President Philippe Joubert said that the deal would "enhance BrightSource's leading position in the solar energy market" and that Alstom's engineering and project management skills would help BrightSource to "make solar energy cost competitive with fossil fuels".

"This partnership with BrightSource is a new step in Alstom's clean power strategy," Joubert added. "BrightSource's pioneering solar tower thermal power technology complements Alstom's renewable energy solutions, building on our strength in hydro, geothermal, wind, tidal power, biomass and waste-to-energy solutions."

BrightSource has contracts for a total of 2600 MW with PG&E and Southern California Edison - California's two largest utilities. To meet this demand, the company intends to build 14 solar power plants in the US southwest by 2016.

BrightSource's first US power project, the 392 MW Ivanpah Solar Energy Generating System, is currently under development in San Bernardino County, California.

## Suzlon targets Bulgaria

Wind power company Suzlon has agreed to set up a joint venture with a Bulgarian wind developer in order to take advantage of growth opportunities in the country.

Suzlon Wind Energy, the European unit of the India-based wind turbine manufacturer, has agreed a deal with Volkswind Bulgaria GmbH, a subsidiary of Germany's Volkswind. The joint venture will combine Volkswind's local knowledge and development experience with Suzlon technology and develop utility-scale projects.

Erik Winther Pedersen, CEO of Suzlon Wind Energy, said that the deal was "a very important step in our strategy to expand our project development activities into new regions". Suzlon already has a 13 MW wind project under construction in Bulgaria, which is seen as one of the most attractive wind markets in eastern Europe.

According to Suzlon, Bulgaria is expected to install 500 MW of wind energy capacity by the end of 2010 and up to 3000 by 2020. The market is supported by competitive feed-in tariffs.

## New E.On CEO ready for change

- New management appointments made
- Economic challenges persist

The new chief executive of German utility E.On says that the continued economic uncertainty could still affect the company's performance over the next year in spite of a solid performance in the first quarter.

Johannes Teysen replaced Wulf Bernotat at the start of May, just after the outgoing CEO clinched a deal to sell the utility's US power and gas business to

PPL Corp. for \$7.6 billion.

Teyssen predicts flat to slightly higher earnings for E.On in 2010 over the previous year and told shareholders in early May that "it would be a mistake to think we're now out of the economic woods".

The company reported a 20 per cent increase in first quarter EBIT to €3.7 billion, largely due to strong performances

in its retail and energy trading businesses.

Teyssen has warned that the current oversupply in the gas market was an immediate challenge for E.On. He is expected to start his new position with a strong focus on improving the efficiency of the company and simplifying its structure.

He has already made a number of key management changes in a move thought

to signal his desire to get more control over the company's operations.

Bernotat's final deal to sell the group's US operations will make a large dent in E.On's debt and means that Bernotat surpassed his goal of raising at least €10 billion by the end of the year from asset sales.

E.On's US assets include utilities Louisville Gas and Electric Company (LG&E) and Kentucky Utilities Company (KU), which it bought in 2002 as part of the purchase of Powergen in the UK. In all, its US business has an annual turnover of €1.8 billion and supplies 940 000 electricity and 321 000 gas customers in Kentucky's regulated market.

Pennsylvania-based PPL said that it would issue up to \$2.6 billion in common stock to finance the deal.

New appointments at E.On include Jørgen Kildahl, who will join E.On from Statkraft and oversee electricity and gas production, global trading and energy management. Another outside appointment was that of Regina Stachelhaus, who has been named as industrial relations director and who comes to E.On from Hewlett Packard.

E.On CEO: Johannes Teysen

## ABB buys Ventyx

ABB has strengthened its expertise in software for electricity distribution networks through the acquisition of a specialist firm from a US private equity group.

The Swiss-based technology company has bought Ventyx from Vista Equity Partners, paying more than \$1 billion for the firm.

Ventyx is a leading software provider to global energy, utility and communications businesses, and the acquisition demonstrates the increasing

importance of software solutions in the energy markets.

Ventyx offers a broad range of solutions such as asset management, mobile workforce management, energy trading and risk management, energy operations and energy analytics, says ABB. The company also provides software solutions for planning and forecasting electricity needs, including renewables.

"The big advantage for energy companies, utilities and industrial

customers is that they will now have a single supplier of enterprise-wide information technology platforms and power automation systems," said Joe Hogan, ABB's CEO. "The advantage for our shareholders is a cash-generating acquisition in an exciting growth market, with a strong management team, a highly complementary offering and geographic scope, and an attractive return on capital employed."

The increasing use of renewable energy poses challenges for network

operators in terms of balancing the unpredictable output of renewable energy generators with conventional sources of generation. Software has become increasingly sophisticated, and renewable generators are also now expected to give accurate predictions of their output.

The Ventyx acquisition will help to support ABB's smart grid development activities, and will also allow it to expand into areas such as customer database and billing software.

## Tenders, Bids & Contracts

### Americas

#### Siemens equips Californian repowering project

Siemens Energy says it has received an order to provide the power island for the repowering of a power plant in California, USA.

The German firm will supply two SGT-800 gas turbines, an SST-600 steam turbine generator, two heat recovery steam generators and a condenser to the El Centro Generating Station Unit 3, which was first commissioned more than 50 years ago. The plant is owned and operated by Imperial Irrigation District (IID), California's third largest public power provider.

Siemens will also provide state-of-the-art NOx and CO emission control systems that meet best available control technology requirements. The project, which will boost the plant's output by 100 MW to 333 MW, is due for completion in May 2012.

#### Wärtsilä receives largest power plant project order

Finland's Wärtsilä is to embark on building its largest power plant ever after receiving an order from Energética Suape II SA, a Brazilian company jointly owned by CIBE Participação SA and Petrobras.

Under a turnkey contract valued at close to €200 million, Wärtsilä will build a 380 MW plant powered by its 20V46 generating sets in the Suape industrial district in the province of Pernambuco, northeastern Brazil. The plant will be fuelled by heavy fuel oil and will help to reduce Brazil's dependence on hydropower.

Commercial operation of the plant is scheduled for January 1, 2012.

#### REpower signs Stoney Corners contract

REpower USA has signed a contract with project developer Heritage Sustainable Energy to supply nine wind turbines for a site in Michigan, USA.

The nine MM92 wind turbines will be installed at the Stoney Corners III wind farm project near the city of McBain and will have a total output of 18.45 MW. The contract is the third between REpower USA and Heritage, and also provides an option for the delivery of another 70 MM92 turbines for additional Heritage projects in Michigan.

#### ABB wins Brazil power order

Brazilian firm Transmissora Delmiro Gouveia (TDG) has awarded ABB an order to supply two new substations and expand two existing substations in northeastern Brazil.

ABB will deliver one of the largest transformers ever built in Brazil for the project, providing one of the new substations with twice the transforming capacity of typical substations in the country. ABB will also increase the transforming capacity of two existing substations.

"These substations will enhance transmission capacity to help meet an increasing need for electricity driven by economic growth in the country," said Oleg Aleinikov, head of ABB's substations business. "They will also strengthen grid reliability and improve power stability in the region."

#### Siemens secures landmark US wind contract

Siemens has secured its largest single order for the US onshore wind energy market, winning a contract to supply the turbines for the Lower Snake

River wind project in Washington state, USA.

Awarded by Puget Sound Energy (PSE), the order includes 149 turbines rated at 2.3 MW each. Siemens will install and commission the turbines, and the contract also includes a five-year service agreement.

PSE has an option to purchase an additional 110 SWT-2.3-101 turbines for later phases of the project.

The SWT-2.3-101 turbine was introduced in April 2009 and has become the best-selling wind turbine in the USA, says Siemens. Its 101 m-long rotor is specifically designed to optimise the energy returns in areas with moderate wind conditions.

### Asia Pacific

#### Alstom bags Jorethang Loop hydro project

Dans Energy Private Limited and Alstom have signed a deal worth around €18 million for the construction of a new hydropower project in India's Sikkim region.

The 96 MW Jorethang Loop hydropower plant will be built in the city of Jorethang on the river Rangeet, a tributary of the river Teesta. Alstom will supply, install and commission the turbines, generators, control system and balance-of-plant for the plant's two units.

### Europe

#### SSE to build biogas plant

UK utility Scottish and Southern Energy (SSE) is to start the construction of a biogas power plant at a former landfill site in Scotland after signing a £13.5 million (\$20 million) deal.

The Barkip plant will be the largest of its kind in Scotland and is due for completion in 2011. The site will process around 75 000 tonnes of waste per year and will have an output of 2.5 MW.

Project partner William Tracey has signed a 25-year contract to supply feedstock materials for the plant. Suitable materials will include waste foods, manures and organic effluent sludges.

Ian Marchant, SSE CEO said: "SSE is excited about entering the biogas market, which we believe offers opportunities beyond on-site electricity generation to include connections to the gas distribution network in the future."

#### Wetfeet awards offshore substation contract

Wetfeet Offshore Windenergy, a German wind energy project development company, has awarded Keppel Verolme and Areva Transmission and Distribution a contract to build an offshore high voltage substation.

The turnkey project involves the supply and installation of a self-floating, self-installing 155/33 kV offshore high voltage substation (OHVS) to connect the 1400 MW Global Tech offshore wind farm, located in the German Exclusive Economic Zone in the North Sea, to the offshore high voltage direct current grid.

#### Westinghouse chosen for Chooz dismantling

Westinghouse Electric Company has been awarded a contract by EDF-CIDEN to provide reactor vessel dismantling services for the Chooz A nuclear reactor in France.

Westinghouse and its partner, Nuvia France, will undertake the six-and-a-half year project that will include reactor vessel and internals

segmentation, reactor nozzle cutting, dismantling of the RV thermal insulation, performing ALARA (As Low As Reasonably Achievable) forecast to ensure acceptable personnel dose, and providing a complementary water filtration system to maintain water clarity during the segmentation work.

The first of a three-reactor plant, Chooz A was shut down in 1991 after an operational life of 24 years. It will become the first pressurised water reactor (PWR) in France to be fully dismantled.

#### B&W Volund to supply WTE boiler

A new waste-to-energy (WTE) power plant in Sweden will be equipped with a boiler from Babcock & Wilcox Volund (B&W) after it received an order from Oresundskraft AB.

The plant, located in Helsingborg, Sweden, will be a greenfield 67 MW combined heat and power unit capable of burning approximately 220 000 tons of waste per year. B&W's project scope includes a combustion system, steam boiler, electrical, control and monitoring systems.

The project is scheduled for completion in early 2013.

### International

#### Siemens receives Bulgaria order

Austria-based Energie Versorgung Niederösterreich (EVN) has placed an order with Siemens Energy for the construction of a combined cycle district heating power plant in Bulgaria.

The new power plant will be built in the city of Plovdiv and will consist of an SGT-700 gas turbine, SST-300 steam turbine and a heat recovery steam generator with supplementary firing. It will have an output of 50 MWe and up to 55 MW of district heat.

#### GE steam turbines for Qurayyah expansion

The Saudi Electricity Company has awarded GE a \$300 million contract for the supply of five steam turbines for the expansion of the Qurayyah open cycle power plant.

The five steam turbines will join 15 GE F-technology gas turbines already operating at the site, converting the plant to combined cycle operation and increasing output from 1907 MW to 3148 MW. The conversion project is scheduled for completion in the second quarter of 2012.

The expansion of the Qurayyah power plant, which is located in Eastern Province, is a major part of Saudi Arabia's plans to boost generating capacity and increase the operating efficiency of the power generation fleet.

When the Qurayyah plant conversion is completed, the combined cycle facility will include five GE 307FA combined cycle packages, each featuring three Frame 7FA gas turbines and one GE D Series steam turbine.

#### Wärtsilä wins floating plant O&M agreement

Wärtsilä has been awarded operations & maintenance (O&M) contracts for two floating power plants that will be used to boost Iraq's energy capacity.

The two power plants have a combined output of 346.5 MW and are scheduled to be commissioned in the summer of 2010. They will be moored in the ports of Um Quasr and

Al Zubayr, near Basra, South Eastern Iraq, and will play a key role in easing power shortages in the country.

The two power plants covered by the O&M agreement are owned by Turkey-based Karadeniz Holding AS, which acquired a series of second-hand generating sets from China and Dubai for the project.

#### Abu Dhabi awards power grid contract

The Abu Dhabi Transmission and Dispatch Company (Transco), Abu Dhabi's national electricity grid operator, has awarded Siemens Energy an order, as part of the project to expand the country's power distribution network.

Siemens and its partner Electromechanical LLC will supply five turnkey transformer substations including switchgear for the project. Siemens' share of the order is worth a total of approximately €150 million

The substations are scheduled for completion by 2013.

The order entails the turnkey supply of three 132/11 kV transformer substations and two 132/22 kV substations. They will be equipped with twenty 40 MVA transformers, gas-insulated switchgear, and protection and control equipment. A total of 356 gas-insulated switchgear bays comprising 46 for the 132 kV voltage level, 124 for 22 kV and 186 for 11 kV are to be supplied from Siemens' plants in Berlin and Frankfurt.

#### Daewoo to build Israel plant

OC Power Ltd. (OCP) has awarded South Korea's Daewoo Corp. a contract to build a new power plant at Mishor Rotem, Israel.

Construction of the 440 MW plant will begin in 2010, with commercial operation slated for the end of 2012. OCP has an option to build another power station in Israel at the same price within the next 18 months, according to reports.

Japan's Mitsubishi Power Systems will supply the gas turbines for the project.

OCP is owned by Israel Corporation and Veolia Environnement.

#### Areva and Siemens team up for Mochovce

A consortium of Areva and Siemens Energy is to supply the digital supervision, protection and control systems for units 3 and 4 of Slovakia's Mochovce nuclear power plant.

Slovenské Elektrárne a subsidiary of the Enel Group, is completing the construction of two reactors based on VVER technology. The two new units will be equipped with Teleperm XS safety I&C supplied by Areva and SPPA-T2000 operational I&C from Siemens.

#### Siemens to supply Russian CCGT

Siemens Energy has won an order to supply the main components for the Yuzhnouralskaya GRES-2 combined cycle power plant in Russia, which is being built by Atomstroyexport for OJSC Third Generating Company (OGK-3).

Under the contract, Siemens will supply a SCC5-4000F 1 S power train comprising an SGT5-4000F gas turbine with a capacity of 288 MW, a steam turbine, a hydrogen-cooled generator and the turboset I&C system. Delivery of the components is scheduled for the summer of 2011 and the plant will start commercial operation at the end of 2012.



# Renewables: turning challenges into opportunities

A recently published Eurelectric report outlines the challenges and solutions surrounding the integration of intermittent renewables sources into the EU electricity system. **Gunnar Lundberg**

Increasing the share of renewable energy sources (RES) in the energy mix as required by EU law, will lead to a number of challenges for the European power supply industry. But these can be turned into opportunities.

The European Union's decision to have at least 20 per cent of its energy supplied through renewable sources by 2020 requires Europe's electricity markets to reach a renewables share of 30-35 per cent of all generation sources, according to most estimates.

The increased production from renewables will be based, to a large extent, on wind and solar power. These are by their nature intermittent, unpredictable and unevenly distributed geographically. Achieving these targets will thus have significant and far-reaching effects on the electricity market and on transmission and distribution grids.

Eurelectric, which represents the European electricity industry, fully supports the 2020 targets and is committed to carbon neutral power supply by 2050. In its report entitled *Integrating intermittent renewables sources into the EU electricity system by 2020: challenges and solutions*, Eurelectric identifies the various challenges to meet the agreed targets ranging from wholesale price dynamics to the grid development, and proposes efficient solutions.

The increase in renewables will affect wholesale price dynamics. The marginal costs of generating wind (and solar) energy are very low. Depending on the amount of expected wind energy, there will be a different structure of marginal costs in the market and consequently a shift in the supply curve. Depending on the wind injection and the actual supply and demand curve of other market participants, prices will change much more from hour to hour compared to a case without wind injection. As a result, spot price volatility will increase.

With increasing injection of RES, there may also be an increase in the frequency of situations where there is more supply than demand, even at wholesale prices equal to zero. This is due to the non-storability of electricity. To deal with this issue, some power exchanges have already introduced negative price boundaries (e.g. EPEX Spot and Nord Pool Spot).

Negative prices indicate two major shortcomings: firstly that the necessary price signals to maintain an appropriate balance between supply and demand are missing; secondly that there is a lack of grid capacity for transporting the energy generated at low marginal cost to places where it is less efficient (or less profitable due to the different support schemes) to build similar RES plants. On the other hand, negative prices will increase price volatility, and will therefore attract investments (for instance in flexibility, storability) that will in turn mitigate the volatile environment.

Eurelectric therefore recommends that common rules should be developed for neighbouring countries to avoid distortions related to negative prices.

Traditionally, the amount of balancing energy, or reserve, provided by controllable thermal or hydro

generation has to be sized to balance variations in demand or forced outages of the largest production unit. Large penetration of intermittent and, in particular, wind generation introduces additional requirements for balancing products and services. Since wind generation has limited predictability larger amounts of flexible sources are necessary to cope with the forecast error.

The consequence for electricity systems with a high penetration of wind generation is a higher exposure to problems related to grid stability. Therefore, ancillary services markets should be developed so that customers and generators with flexible consumption or production can "offer" such flexibility to system operators and other market participants.

Eurelectric considers it necessary to ensure a level playing field for balancing responsibility, which applies to all producers, including wind generators, in order to stimulate all market participants to carry out thorough and proper scheduling and forecasting and thus limit system costs. Moreover, integrated cross-border intraday markets with continuous trading are required to allow forecast updates to be incorporated into the market.

Greater electricity generation from RES will call for increased generation investment. Eurelectric's analysis shows that only a small share of wind capacity can be considered as "firm". Every MW of wind capacity generally requires one MW of backup firm capacity to ensure 90 per cent availability. This leads to an important conclusion: greater amounts of wind generation avoids fuel expenses, but still requires investments to be made in backup capacity.

The necessary backup capacity could be provided by new flexible generation plants or by prolonging the lifetime of existing ones. Moreover, a number of additional measures can help to compensate for more frequent imbalances between supply and demand. Examples are increasing interconnection capacity to "import" backup capacity from abroad, developing energy storage facilities (e.g. pump storage, district heating systems, electric vehicles, etc),

introducing "smart grids" and interruptible supply contracts, or indeed any other demand side management mechanism.

Higher RES penetration will result in a significantly reduced load factor for conventional generation, as the RES technologies will replace a growing section of the electricity supply curve. Therefore, the ability of existing back-up plants to recover their fixed costs may be weakened and may lead to earlier decommissioning decisions or discourage new investments.

Eurelectric believes that the market will find the equilibrium market price to stimulate the correct investments,



**Gunnar Lundberg: market integration presents a "software" solution for RES integration**

provided that prices are allowed to change freely and competition authorities accept the "price spikes" that will emerge. Nevertheless, in some cases, the uncertainty faced by investors on the magnitude and frequency of price spikes may put the necessary back-up generation capacity at risk. If this occurs, market design rules may need to be reviewed. Careful analysis is required to assess in which

energy injection will be mainly concentrated in the north of Europe and Iberia, whereas the flexible generation is dispersed throughout Europe (with hydro reserves concentrated in the Nordic area and in the Alps). Should large deviations occur in day-ahead or intraday or balancing phase, all European flexible sources will be required to address such deviations. To achieve this,

## Grid investments are the key enabler to allow markets to cope with large volumes of intermittent RES

cases, under which conditions and on what geographical scale it may be advisable to introduce capacity remuneration models.

Market integration presents a "software" solution for RES integration.

The development of a true internal market in electricity is one of the EU's main energy policy goals and an explicit objective of the Third Energy package. The large amount of planned additional intermittent generation sources will to a large extent challenge the process of market integration, making it more difficult, but at the same time even more necessary.

Based on existing scenarios, wind

market integration tools such as market coupling, cross-border intraday and cross-border balancing are indispensable to ensure and facilitate the contribution (on a competitive basis) of all available flexible sources throughout Europe.

While market integration solutions only represent the "software" tools to achieve the ultimate goal of developing "a true internal market in electricity", this goal will not be reached if the necessary "hardware" is unavailable. Urgent and extensive grid investments are therefore also needed.

Grid investments are the key enabler to allow markets to cope with large

volumes of intermittent RES. The introduction of high levels of RES will not only considerably affect both distribution and national transmission networks but also transmission networks in adjacent and further away countries. Hence the focus on investments should be shifted from a national to a regional and pan-European perspective.

With regard to regional grids (including off-shore grids), costs should therefore also be borne by several Member States given that the benefits are shared among customers from different Member States. The national regulators, together with ACER, must put governing rules in place. Setting up such governance structure is an urgent priority, as it may prove to be a much bigger hurdle in the future if it is not dealt with now.

Finally, the "revolutionary" change that energy markets are required to undergo to reach the RES targets also necessitates an associated revolutionary development in transmission technology. The process needs to be supported by the requisite R&D; therefore the necessary funds to support such R&D have to be established without delay.

Integrating intermittent renewable sources into the EU system while a definite challenge, plays a major role on three fronts: market integration, security of supply and meeting the EU RES targets.

First of all, integration of wholesale markets through the development of cross-border intraday and balancing markets, will contribute decisively to reducing congestion, optimising both domestic and cross-border generation capacity flexibility, improving cross-border electricity trade and integrating RES in the most economically sound way. Moreover, developing and integrating the market's gate-closure time closer to real-time would have a dramatic impact on forecast accuracy and balancing costs.

At the same time, European transmission grids are facing enormous challenges to meet the 2020 targets and will have to undergo a fundamental structural change. This requires top-down grid planning on a European scale, followed by significant and prompt investments to increase cross-border trading. We should question if Member States governments can continue letting the local interests hinder the necessary transmission lines from being built.

Massive investments will also be needed to develop the necessary flexible backup generation capacity, energy storage facilities and to encourage an active participation of demand through smart meters and smart grids. For this purpose regulatory distortions such as price caps should be removed to ensure that correct price signals incentivise, rather than delay, the necessary investments and change in end-users behaviour.

We need to exploit these challenges and turn them into opportunities.

*Gunnar Lundberg is Chairman of Eurelectric Markets Committee and Vice President of Regulatory Affairs at Vattenfall AB.*



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# Assessing the impact of CCS

Combined cycle plants will also need to address carbon capture and storage (CCS) at some point in the future. However, there are a number of considerations in choosing the right CCS technology.

**Dr. Justin Zachary**

The uncertainty surrounding CO<sub>2</sub> emissions legislation is prompting power plant owners to look at accommodating 'add-on' carbon capture and sequestration (CCS) solutions in their current plant designs. However, the variety of CCS technologies currently under development makes it a very challenging task.

While coal fired plants with a high concentration of CO<sub>2</sub> (12 per cent) in the exhaust flue gases are the subject of intense evaluation, it is also evident that the new generation of gas turbine combined cycles gas turbine (CCGT) plants must also address CO<sub>2</sub> capture. In CCGT plants, the capture process has to accommodate low CO<sub>2</sub> concentration in the exhaust gases (around 3 per cent).

There are a number of CCS technologies available, each of which will have an impact on the gas and steam turbines and ultimately reduce the thermal efficiency of the plant.

In the power generation industry, the most common CO<sub>2</sub> capture technologies are:

- Post-combustion capture of CO<sub>2</sub> from the plant exhaust flue gases by the use of chemical absorption
- Capture of CO<sub>2</sub> before the combustion process. In this particular arrangement, intended for integrated gasification combined cycles (IGCC), the fuel is syngas containing mostly hydrogen and CO. The CO is converted to CO<sub>2</sub> in a water-shift reactor then the CO<sub>2</sub> is removed by a physical absorbent and H<sub>2</sub> is used as fuel in the gas turbine.

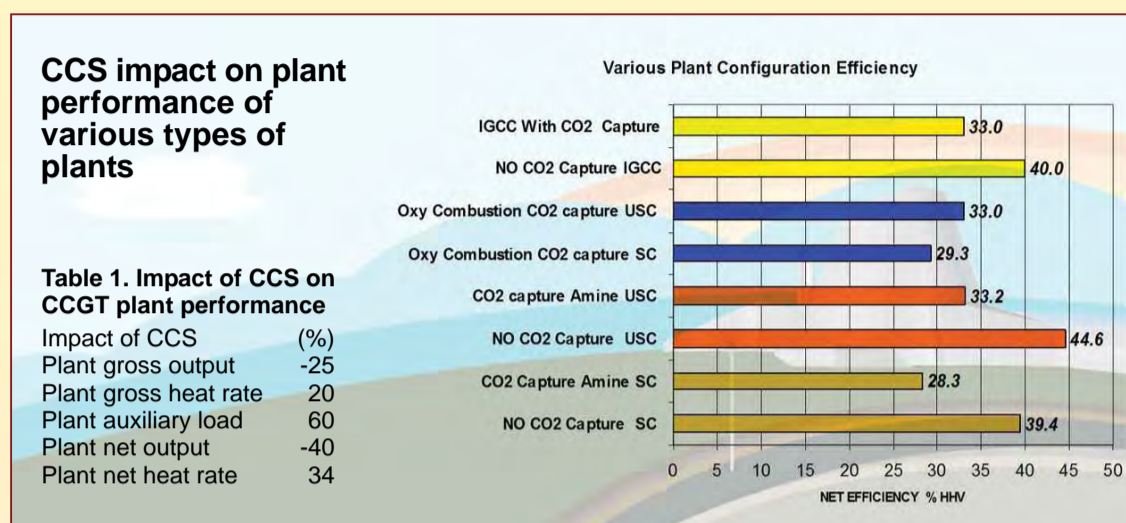
- CO<sub>2</sub> capture from a number of different processes such as oxy-combustion or chemical looping. In oxy-combustion, oxygen rather than air is used to combust fuel, resulting in a highly pure CO<sub>2</sub> exhaust that can be captured at relatively low-cost and sequestered.

Other than the post-combustion amine-based processes, all of these technologies are in various stages of concept validation or small-scale demonstration.

The use of chemical solvents in post-combustion CO<sub>2</sub> capture is a well established technology. The real challenge is to identify the most efficient conversion process in terms of steam consumption for the solvent regeneration and use of electricity for CO<sub>2</sub> compression. The typical impact of a CCS on a combined cycle with an 85 per cent CO<sub>2</sub> capture capability is shown in Table 1.

Before discussing in detail the evaluation process of determining the impact on power generation equipment it is worth mentioning the other implications of equipping a plant with a CCS system.

Primarily, the suitability of the CO<sub>2</sub> sequestration site needs to be considered. If the plant is located far



from an adequate geological storage place or an enhanced oil recovery site, the cost of constructing a pipeline and the additional loads for pumping CO<sub>2</sub> must be accounted for.

Space requirements and plant layout should also be considered. By itself, the CO<sub>2</sub> capture hardware has a large footprint. For amine scrubbing, the CCS plant components (absorber, stripper, compression stations, and various cooling and storage tanks) occupy a significant area.

The plant layout has to accommodate large ducts for the flue gases, which need to be routed from the exit of the air quality control system block, between the induced draft (ID) fan, to the amine scrubber, without interfering with roads, buildings, etc.

Large low-pressure (LP) pipes are needed to transfer the steam from the steam turbine generator to the amine scrubber; this requires pipe racks with adequate support. The entire balance of plant equipment must also be augmented to cater to the CCS requirements.

The electrical system design for transformers, transmission cables, motor control centres, etc., needs to be enhanced. Particularly when existing plants are being retrofitted with CCS capabilities, the ripple effect of adding a CO<sub>2</sub> plant requires detailed and careful review.

One other consideration applies to the plant heat sink. It should be sized to allow the condenser and cooling tower to accommodate the additional amount of steam when the post-combustion capture system is not in operation as well as the compression cooling load when the capture process is operating.

In a gas turbine, the nature of the premix combustion system decreases the concentration of CO<sub>2</sub> in the exhaust flue gas to half of that in a coal-fired boiler. Recirculating part of the exhaust gases back to the compressor inlet, called flue gas recirculation achieves

a higher CO<sub>2</sub> concentration. Particularly interesting to note for this mode of operation is the fact that the NO<sub>x</sub> emission levels and combustion system acoustics are substantially improved.

However, the process could affect combustion stability and heat transfer properties. Theoretically, the amount of recirculated flow could be close to 40 per cent of the exhaust gases. It should be noted that the amount of cooling necessary to bring the flue gases from exhaust conditions (at least 40°C) to ambient temperature adds a substantial parasitic load.

A significant amount of steam is required for solvent regeneration. Typical steam conditions are 3 bar and 270°C. The amount of steam for 90 per cent CO<sub>2</sub> recovery from the flue gas may be as high as 1.4 kg steam for 1 kg of CO<sub>2</sub>. This equals more than 50 per cent of the LP steam turbine flow.

It is, therefore, imperative in all plant operational scenarios to consider the possibility that the CO<sub>2</sub> capture plant might not be able to receive part or all of the extraction steam. This is especially important for the case where the steam turbine was permanently configured to operate with a reduced LP steam flow.

Since venting such large quantities of steam is not an option, any design must offer rapid configuration changes that allow the LP modules to operate under zero extraction conditions. The available options to extract the steam from the system are throttle LP, floating-pressure LP, LP spool with clutched LP turbine, and back-pressure turbine.

- **Throttle LP:** This configuration keeps the cross-over pressure constant despite the fact that a large amount of steam is extracted.

- **Floating pressure LP:** In this arrangement, the turbine intermediate pressure (IP) module must be designed to operate with a variable back-pressure.

- **LP spool with clutched LP turbine:** In this scheme, one of the LP modules is connected via a clutch to the generator in an arrangement similar to that used in a single-shaft combined cycle, where a clutch is situated between the generator and the steam turbine.

- **Back-pressure turbine:** If the steam extraction for the post-combustion capture plant is taken from the IP/LP cross-over pipe, the pressure and the temperature are too high for direct use in the sorbent regeneration process. One solution to exploit the available energy is to generate power through a non-condensing turbine.

Beyond the technical challenges, the commercial investment in those specific features aimed at future CCS must be justified. There is a significant risk in selecting a specific CCS technology, because the equipment could become obsolete and result in a stranded asset.

At this juncture, a pragmatic approach requires evaluating all known factors in existing carbon capture technologies, considering the additional space for the carbon capture facility, and laying out the plant to incorporate and modify existing hardware at a later date.

CCS from power generation sources will eventually be required in one form or another, although the timing and the extent of regulations governing the process are only speculative at this point.

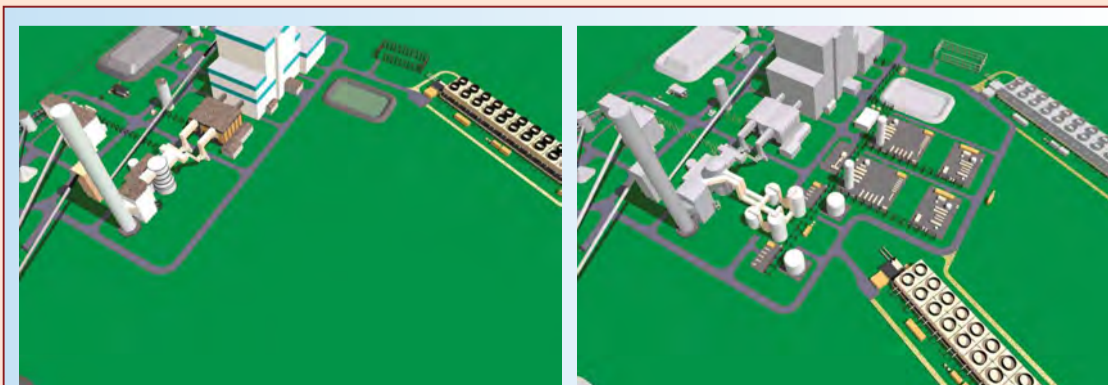
In anticipation of the future greenhouse gases regulations, the power industry is continuing its effort to develop capture and compression technologies, mainly for CO<sub>2</sub>.

So far, none of the existing technologies has emerged as the dominant solution of choice, and many new and innovative alternatives are in various stages of research, development or testing.

The proposed processes all require substantial amounts of energy, which negatively affects plant net power output and efficiency. There is also great uncertainty surrounding CO<sub>2</sub> disposal methodologies in terms of safety, liability and transport to the place of storage.

Apart from the technical implications of various CO<sub>2</sub> capture processes, a collective effort of the engineering community should be devoted to inform and educate the public at large on the direct impact of CCS on electricity production and cost.

*Dr. Justin Zachary is Technology Manager and Bechtel Fellow at Bechtel Power Corporation based in Frederick, MD, USA.*



A carbon capture facility has considerable additional space requirements



## Fuel Watch

## Oil

# Opec watches market as crude prices slip

■ Greece economic turmoil may dampen energy demand  
 ■ Market remains “volatile” and “uncertain”

David Gregory

After hitting a high for the year at \$87.15/b on May 3, the price of West Texas Intermediate (WTI) crude oil slipped to nearly \$70/b in mid-May as concerns over European sovereign debt mounted and the euro traded lower against the dollar. The first half of May also saw crude oil stocks building. In mid-month, the US Energy Information Administration (EIA) reported total US commercial crude inventories at 362.5 million barrels.

The economic mess in Greece has served to raise fears about sovereign debt in other European Union members, particularly Portugal and Spain. While the EU and the International Monetary Fund approved a package to support European economies, their effects failed to stem pressure on oil prices, the market for which is still very much in

the hands of speculators.

Throughout the course of the economic recovery and even during the heady run-up to the global economic downturn, crude has behaved more like a commodity on the equity markets rather than abide by the fundamentals of supply and demand.

The financial situation in Greece and the expected knock-on effect on Europe is causing many analysts to expect the global economic recovery to slow down, causing energy demand to fall back. By contrast, a month ago perceptions on the recovery and future demand were more positive.

Energy producers are now expressing their concerns about what could lie ahead as a result of what is happening in Europe. Qatar's Energy Minister Abdullah Al Attiyah said in Bahrain on May 15 that the EU rescue package for Greece and EU did not instill a

great amount of confidence in the oil market, which remains “volatile” and “uncertain”. Opec member Qatar produces about 800 000 b/d of crude oil and is the world's largest producer of LNG. Before the end of the year, Qatar is to reach an LNG production capacity of 77 million tons/year. Mr. Attiyah said Opec was watching the situation “with nervousness”.

As the price of oil rose, Opec producers were willing to stand aside and watch, but now as it begins to slide, market analysts expect the organisation to defend a \$60/b floor if it becomes necessary.

While Opec leader Saudi Arabia did not want to see the crude price reach \$90/b on the assumption that such a high price could threaten the economic recovery, neither is it expected to tolerate oil at \$60/b.

The Saudis have stated clearly that

prices within the \$70-80/b are essentially perfect, but as always in the oil market, prices trend up – or down. As the market, especially in the US, is now more than adequately supplied, a further decline in prices will likely see Opec urging its members to adhere more closely to its assigned targets. Most members are now over-producing, especially Nigeria, Angola, Iran and Venezuela.

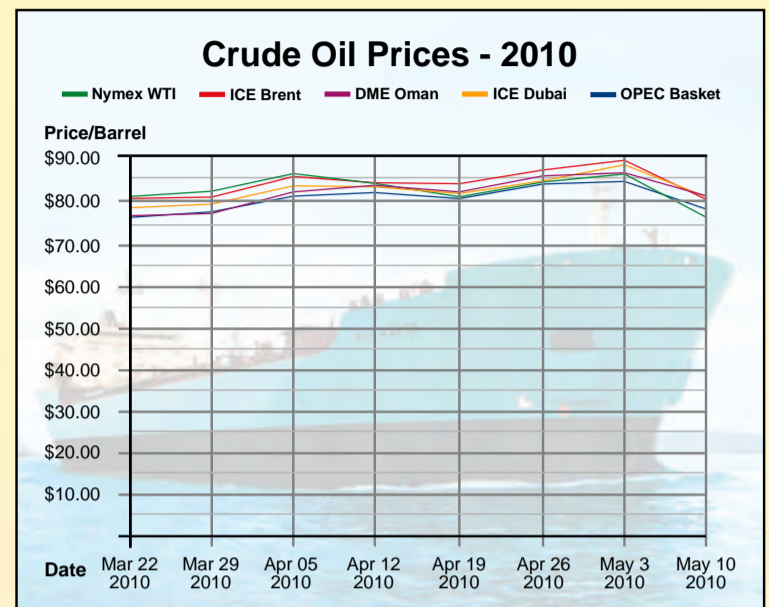
Forecasts for growth in demand in the Western world have been low. Most growth in demand is seen as coming from China and India but there are worries for producers as to whether the Chinese government will try to keep a lid on the country's economic growth.

In its latest monthly forecast, released on May 11, Opec kept its data for 2010 global oil demand growth unchanged from last month at 900 000 b/d, compared to a fall in demand during

2009 of 1.5 million b/d.

Opec said in its *Monthly Oil Market Report*: “Although the economic recovery shows signs of improving momentum, important risks remain that could impact demand growth expectations for this year. China has been among the main drivers behind oil demand increase so far this year, which should continue for the rest of the year despite the recent price increase in its gasoline and diesel.”

The Opec report noted that China's economy is expected to grow by 9.5 per cent in 2010 and India's by 7.1 per cent. “The global economy is improving but the challenges of sovereign debt in the developed countries, the ability of China to avoid overheating, and persistently high unemployment levels need careful monitoring”, Opec's report said.



## Gas

# Agreement may open Southern Gas Corridor

Gaining access to the huge volumes of natural gas in Central Asia and the Caspian region has become the focus of attention for Europe as it looks to establish energy supply security in the years ahead.

Mark Goetz

Despite the fact that demand for natural gas is currently in a slump and is expected to remain there for several years, Europe is facing the decline of its own natural gas resources. Delegates to the 10<sup>th</sup> CIS Oil and Gas Summit in Paris on May 19-21 therefore devoted considerable time to the question of gas supply from the Central Asia and the Caspian region.

Several speakers outlined the projects designed to transport gas from the Caspian and across the Caucasus to Europe through the so-called Southern Corridor, while others analysed the current dilemma of gas supply politics.

The forthcoming agreement between Turkey and Azerbaijan on the issue of supply volumes and transit fees is viewed as the next major step toward opening the Southern Corridor, which now consists of gas shipments averaging around 6 billion m<sup>3</sup> (bcm) annually to Turkey and the further shipment onward of less than 1 bcm to Greece through the Interconnector-Turkey-Greece (ITG) pipeline across the Dardanelle strait.

Turkish Prime Minister Recep Tayyip Erdogan and Azerbaijani President Ilham Aliyev were scheduled to meet in Istanbul in early June to sign a deal that

has been under consideration for some time. It is to agree costs and transport fees not only for the gas from Azerbaijan's Shah Deniz gasfield that Turkey now receives, plus the price and fees of gas that will come from Shah Deniz Stage 2 (SD2) development, which should come on-stream sometime after 2014. SD2 is to match – and is expected to exceed – the field's current design capacity of 8.6 bcm/year.

The inability of Turkey and Azerbaijan to come to an agreement on terms has been viewed as a key obstacle in the development of the Southern Corridor, which for Europe consists of the proposed 31 bcm/year-capacity Nabucco gas pipeline and the Interconnector-Turkey-Greece-Italy (ITGI) pipeline, from which the Trans Adriatic Pipeline (TAP) and the Interconnector-Greece-Bulgaria (IGB) will proceed.

The 3300 km Nabucco pipeline is to run from eastern Turkey, through Bulgaria, Romania and Hungary to the Central European Gas Hub in Baumgarten, Austria. The upcoming Turkey-Azerbaijan agreement is expected to open the field among Western consumers for competition for SD2 gas. Nabucco partners, Greece, Italy and Bulgaria – through the ITGI and IGB

pipelines – as well as TAP, which could move the gas into Switzerland via a pipeline across Albania, the Adriatic and through Italy – will be looking to secure deals with Azerbaijan.

Realising that Azerbaijan will not be able to supply its full capacity, Nabucco is looking also for supplies from Iraqi Kurdistan, where partners OMV of Austria and MOL of Hungary are engaged in natural gas exploration and development.

Meanwhile, Russia is looking to supersede both Nabucco and the ITGI with its South Stream gas pipeline across the Black Sea. The pipeline has a design capacity of 63 bcm/year and operator Gazprom is keen to secure for its own use the output from SD2.

Further questions surround the future of Turkmenistan gas and how it might arrive in Europe without crossing Russian or Iranian territory. The sole feasible prospect for this is a natural gas pipeline across the Caspian Sea. A Trans-Caspian pipeline would carry Turkmen gas to Azerbaijan and a supposed connection at the Sangachal oil and gas processing terminal. From there it would be shipped through the existing and operational South Caucasus Pipeline (SCP), which currently carries Shah Deniz gas to

Turkey.

The entry of Turkmen gas into the situation would mark a major step forward for the Southern Corridor, but when this might occur remains more hypothesis than tangible possibility. As explained by one speaker, Turkmen is committed to developing numerous export routes for its gas and is willing to deliver gas to a purchaser at its border. However, it makes no commitment to a Trans-Caspian pipeline, which would presumably have to start on the country's Caspian shore.

The unresolved legal status of the Caspian Sea does not present an obstacle to the construction of a Trans-Caspian gas pipeline, delegates were told by several speakers. This is in spite of previous statements made by Russia and Iran – both Caspian littoral states – that they would oppose such infrastructure.

If there are no legal obstacles to the construction of a Trans-Caspian connection to Turkmenistan, then those that do exist are political or economic. Azerbaijan and Turkmenistan are currently negotiating their offshore boundary disputes, a resolution of which could provide further ease in movement toward such a project.

The economic dilemma will probably

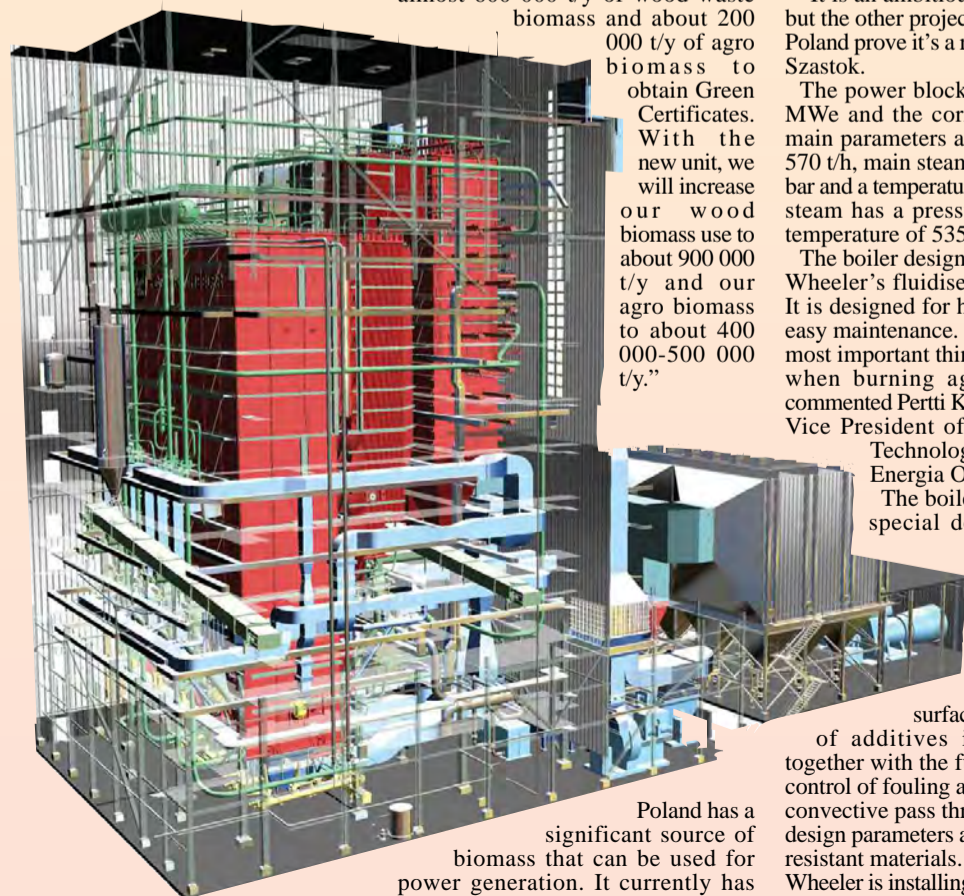
not be solved until European customers organise themselves into an entity that Turkmenistan are comfortable with. That would likely be a consortium that presents itself as a prime customer and, like China, be willing to sign up for 30 bcm/year or more.



# Going big on biomass

EU directives promoting the use of renewables is seeing an increase in the size of biomass fired power plants. The end of 2012 will see the start-up of what will be the world's largest project running on 100 per cent biomass in Poland. **Junior Isles**

Cutaway of a CFB boiler. The boiler has the ability to combust the fuel completely and control emissions without back-end cleanup



Increasing the use of biomass for power generation is part of Europe's goal to reach a target of 20 per cent of renewables in the power generation mix by 2020. As each member country sets out its own method of reaching the renewables goal, Poland has taken an aggressive approach in providing incentives to spur the growth of biomass fired power projects.

The Polish government's strategy is to promote the use of biomass locally produced from agricultural waste (agro biomass). According to a law introduced at the end of 2008, in order to obtain green certificates for all the electricity produced in a power unit, the share of agro biomass in 100 per cent biomass fired boilers must increase from 20 per cent in 2012 to 60 per cent in 2017.

The new rule applies to all generators but the Polish policy rewards early movers (plants that will start operation by the end of 2012) by exempting them from the climb in the required agro share. In this particular case the limit of the share of agro biomass will stay at 20 per cent even beyond 2012 and the operators will still be eligible to obtain the green certificates which currently trade at about €60.

Accordingly, generators are moving quickly to set up biomass based power projects before the 2012 deadline. Notably, March this year saw GDF Suez award a contract to Foster Wheeler to build what is being claimed as the world's largest circulating fluidised bed (CFB) to be fired on 100 per cent biomass at the Polaniec power station.

Commenting on the business case for the new plant, Robert Zadora Vice president of the Board GDF Suez Energia Polska S.A. noted: "You have to evaluate the best investment when considering the technology, the costs and the Law. According to our current assumptions, building a power plant using 100 per cent biomass before the 2012 deadline presented the best but very challenging case today. Currently we are burning almost 600 000 t/y of wood waste biomass and about 200 000 t/y of agro biomass to obtain Green Certificates. With the new unit, we will increase our wood biomass use to about 900 000 t/y and our agro biomass to about 400 000-500 000 t/y."

Poland has a significant source of biomass that can be used for power generation. It currently has

about 35 million t/y of wood waste available for power production and about 12-14 million t/y of agro biomass. The ability to use this waste product as a fuel source is good for the economy and generators.

Robert Giglio, Marketing Director for Foster Wheeler's Global Power Group said: "The good quality biomass is typically from long growth, wood stock but this is of limited supply in Poland. Instead of using the good quality wood, which can be used to make furniture and paper etc, the Polish government is promoting the use of agro biomass, which is more difficult to burn. They therefore get the 'green' value of biomass while limiting the use of high quality wood."

Foster Wheeler says it has seen a strong interest in CFB boiler technology in Poland. "This is due to its flexibility to burn a wide range of biomass including the more difficult-to-burn agro type biomass. At the same time, CFBs achieve thermal cycle efficiencies similar to coal fired boilers," explained Grzegorz Szastok, Commercial Director, Foster Wheeler Polska.

The Polaniec boiler is specially designed to burn, on a large power plant scale, wood chips in combination with 20 per cent of agricultural derived fuel such as straw pellets or crushed briquettes, sunflower pellets, fruit husk pellets, and crushed palm kernel shells.

Under its contract, Foster Wheeler will provide a 190 MWe CFB boiler island and a biomass handling plant. The plant will be built on a brownfield site next to the existing units at the Polaniec power station. The contract also includes the civil works, foundations and piping from the boiler to the existing turbine.

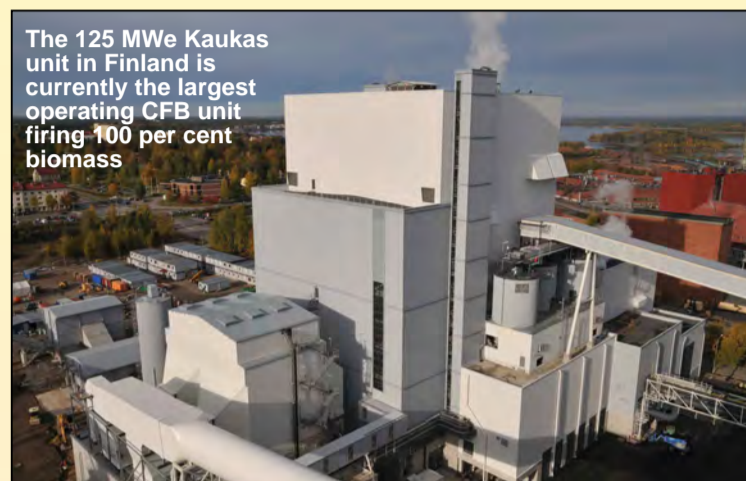
Engineering of the project began in March and is now in full swing. Civil works will start in the middle of this year and the boiler will be delivered throughout 2011. Commissioning is expected to begin in the middle of 2012, ready for commercial operation before the end of 2012.

"It is an ambitious project schedule but the other projects we have done in Poland prove it's a realistic one," noted Szastok.

The power block will produce 190 MWe and the corresponding boiler main parameters are a steam flow of 570 t/h, main steam pressure of 127.2 bar and a temperature of 535°C. Reheat steam has a pressure of 20 bar and temperature of 535°C.

The boiler design is based on Foster Wheeler's fluidised bed technology. It is designed for high reliability and easy maintenance. "These are the two most important things to the operator, when burning agricultural fuel," commented Pertti Kinnunen, Executive Vice President of Engineering and Technology, Foster Wheeler Energia Oy Group.

The boiler has a number of special design features. It allows control of bed material agglomeration and fouling in the furnace through moderate thermal loading of heat surfaces, and the feeding of additives into the furnace together with the fuel. It also permits control of fouling and corrosion in the convective pass through conservative design parameters and using corrosion resistant materials. In addition, Foster Wheeler is installing online diagnostics



The 125 MWe Kaukas unit in Finland is currently the largest operating CFB unit firing 100 per cent biomass

to monitor fouling and corrosion in the boiler during operation.

Getting the right fuel mix into the boiler is crucial. Accordingly, there will be a fuel quality management system at the fuel yard to ensure the proper fuel mixture and quality. Screening to remove stones and other unwanted materials will be carried out in this area. Sampling and analysis of the fuel will help increase plant reliability and reduce maintenance costs.

GdF Suez will produce the wood chips in the chipping process at the fuel yard. Agro bio fuels will come already pelletised from external suppliers within a 100 km radius of the plant. The various agro fuels will be kept in separate silos and further mixed with wood chips according to certain parameters such as moisture, ash, alkali content etc.

The wood chips/agro biomass mixture feeding the boiler has a lower heating value of 9.7 - 12.1 MJ/kg, a moisture content of 30-45 per cent, ash content of less than 2.5 per cent and bulk density of 300-400 mg/m<sup>3</sup>.

The different biofuels have a similar chemical analysis, with the exception of ash quality. The alkalis are basically sodium and potassium, which at high temperatures can form a melting slag that can cause fouling on the heat transfer surfaces and bed agglomeration problems in the furnace.

Kinnunen commented: "This can have an impact on reliability and maintenance of the unit. Therefore the presence of alkalis, which are mainly present in the agro fuel, is taken into account in the design of the unit."

The main emissions to be controlled in the boiler are NO<sub>x</sub>, SO<sub>x</sub>, CO and dust. Other than an electrostatic precipitator for dust removal, the plant needs no other emission control equipment between the boiler and stack.

"The natural features of CFB combustion ensure low emissions. The CFB uses limestone to control SO<sub>x</sub> and a low combustion temperature to ensure low NO<sub>x</sub> emissions. The CFB also has the capability for ammonia injection to further reduce NO<sub>x</sub> if needed," said Kinnunen.

He added: "The emissions from this plant will be well below those required by the EU Large Combustion Plants Directive."

Under dry conditions at 6 per cent O<sub>2</sub>, NO<sub>x</sub> will be less than 150 mg/Nm<sup>3</sup>, SO<sub>2</sub> less than 200 mg/Nm<sup>3</sup>, CO under 50 mg/Nm<sup>3</sup> and dust less than 30 mg/Nm<sup>3</sup>.

Foster Wheeler says that the ability to control emissions without back-end cleanup and combust the fuel completely, are a major advantage of

CFB combustion.

Giglio said: "There are a number of technologies that can burn biomass but the CFB in our opinion is the most advanced. They can go to higher steam conditions and handle these fuels better. It also has the advantage that it can be scaled up beyond the other technologies."

According to Foster Wheeler, its 125 MWe Kaukas unit in Finland, which just started this year, is currently the largest operating biomass unit today firing 100 per cent biomass. This is followed by the company's Igelsta unit in Sweden at 85 MWe, which went on-line in 2009. At 190 MWe, Polaniec will be larger than both of these.

Foster Wheeler believes there is really no technical design limit to the size of a CFB biomass unit. Other boiler technologies such as bubbling fluidised beds (BFB), or grate boilers are limited by their inability to maintain even fuel mixing and combustion as the units grow beyond the 50-75 MWe size range.

"In a CFB, the fuel is fluidised to a point so that the entire bed is lifted and circulated to the top of the furnace, collected by solid separators and returned back to the furnace. This ensures the best mixing for clean and efficient combustion of the fuel," explained Giglio.

"For a CFB biomass plant, our experience has been that the size of the plant is almost always limited by the local supply of biomass. Biomass plants are most economical when their fuel is sourced from within a 50 km radius to the plant," he added.

However, for some projects with more aggressive incentive programmes, like Drax in the UK, importing fuel pellets from overseas has become more economically viable and plant sizes for these projects are under consideration for up to 300 MWe.

As generators and industrial installations look to reduce CO<sub>2</sub> emissions through the increased use of biomass, Foster Wheeler is continuing its focus on expanding its fuel experience into the more difficult to burn agricultural biomass while at the same time improving plant efficiencies by increasing steam temperature and pressure.

Kinnunen concluded: "Our goal is to optimise and advance CFB technology and offer units for utility scale combustion of clean wood at 570/570°C steam temperatures with at least 30 per cent agro biomass in the combustion. We are also looking at utility scale combustion at 605/605°C steam temperatures for coal with a high portion of agro biomass in co-combustion."

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Junior Isles

## Round and round the garden

Earlier this week, I saw a young man clip a rose from the front garden of a house that clearly was not his. Some might see him as a young romantic, no doubt on the way to give the cherished flower to a loved one. Others may see him as simply a man with light fingers. I understand that such 'green collar' crime is on the up.

Green collar crime has been used to describe environmentally-related crime – for example, acts such as the stealing of plants, flowers, or even solar panels from houses. Perhaps now we should add 'carousel fraud' in emissions trading to the list.

Carousel fraud in emissions trading occurs when carbon credits are bought VAT-free in one country and sold on along a chain of traders. The last trader in the chain sells the credits in another country, declares VAT and collects a reimbursement. The trader then disappears before paying the tax to the authorities. The ingenuity of the criminal mind never ceases to amaze.

Although carousel fraud, also known as missing trader fraud, can be committed on any goods the EU Emission Trading Scheme's carbon allowances are susceptible because they are high value, intangible and easily traded.

For the green collar criminals, it has been a lucrative business. In the UK a carbon trading carousel fraud currently under investigation is thought to be worth £38 million. It is also thought that a similar fraud, for which the German authorities have just launched an investigation, is worth an estimated €180 million.

To tackle the problem EU finance ministers passed a directive earlier this year to clamp down on VAT fraud, while some countries have now removed VAT from carbon credits.

But carousel fraud is just one of a series of setbacks in recent months that have highlighted weaknesses in the EU ETS.

In addition to VAT fraud, it has been the subject of cyber crime. In March there was the controversy surrounding Hungary's sale of 'used' carbon credits where Budapest sold certified emissions reductions (CERs) which Hungarian companies had already used to offset against their emissions in the EU ETS.

International trade in recycled credits is legal, and exploits the fact that the greenhouse gas emissions of some former communist countries are far below their Kyoto targets, leaving them with surplus emissions rights called assigned amount units (AAUs).

However, used CERs are invalid as carbon offsets in Europe and the Hungarian deal drew criticism after the used CERs were traded on the Paris-based BlueNext exchange. This meant EU companies could unwittingly have bought invalid offsets. The European Commission quickly amended trading rules to stop used CERs from re-entering the EU carbon market.

In light of the recent scandals, in late April a working group known as the Prada committee, commissioned by French Economy Minister Christine Lagarde, delivered a report calling for better regulation of the carbon market. Notably, the report warned that the planned auctioning system foreseen for carbon credits could increase the risk of market abuses.

A draft regulation was presented to EU member states in April that would see a joint platform for auctioning carbon permits established during the third phase of the EU ETS, which starts

in 2013.

The EU's revised auctioning plan was the subject of debate at a conference held by the International Emissions Trading Association (IETA) and Eurelectric in early May.

Many believe that a centralised auctioning system would better limit market abuse. And while, the European Commission's first draft showed that it was indeed planning to implement a centralised auctioning plan, it backed down from adopting a European approach. Member states now have the chance to opt out from the centralised platform and continue auctioning their allowances at national level – something Germany and the UK have been keen to maintain. Spain and Poland had also joined Germany and the UK in a blocking minority.

Commenting on the potential

agreement soon. She requested more stringent harmonisation of operating rules and a robust regulatory framework for oversight of the carbon market.

The wariness about multiple use of the opt-out provisions is increased by the way the regulations treat these opted-out auction platforms.

Derwent noted that while some IETA members support the principle of States being allowed to make their own rules, he remains uneasy. "You would expect them to make their own rules but that is exactly the problem. That's how you get things going wrong. If you look at the auction regulations in detail, there are no provisions in the auction regulation for opted-out auctions to report suspicious activity, actual irregularities or strange movements," he said.

### Carousel fraud is just one of a series of setbacks that has highlighted weaknesses in the EU ETS

problem of multiple platforms, Henry Derwent, CEO and president of the IETA said: "We do worry about the possibility of unwittingly opening up differences in procedures between one auctioning platform and another, which could be exploited in some way. There is a general air of discomfort around the market generally at the idea that we are putting in place new systems related to parts of the European carbon market that are deliberately disharmonised rather than harmonised."

Derwent is certainly not a lone voice. At the conference, Diane Simiu, French Ministry of Sustainable Development said she regretted that the auctioning draft regulation allows member states to have their own auctioning system but stressed the need for reaching an

This is not as bad as it sounds since the rules for an opted-out auction platform have to be scrutinised by the Commission before Europe grants or withholds permission to a member state to conduct opted-out auctions. However, Derwent cautioned: "...the approval by Europe will only be given if the regime put forward by the member state wanting to opt-out is as tough or tougher than the one for the common platform ... but things could go wrong. The member state has to give the 'utmost consideration' to what the Commission says but it's not as if the Commission has ultimate power of veto."

Allowing member states to make up their own market oversight rules is perhaps tempting fate. It raises the

question as to why certain member states are insisting on this and why the EC is allowing it.

During the conference Erik Pitkethly (UK permanent representation) called for common and robust rules but added: "There has been an assumption that the common platform will safeguard the market, but this is not clear." This may be true but it is more likely that the motive of the UK's wish to opt-out is due to the Treasury's phobia of any government revenue passing through EC hands. Spain and Poland have no experience in auctioning, but why Germany has followed the UK in the opt-out debate is yet to come to light.

In its report, the Prada committee suggested the creation of a new European surveillance authority or a decentralised surveillance system run by national financial supervisors and energy regulators – and coordinated at EU level by the proposed European System of Financial Supervisors. It also emphasised the quality of information, particularly on creating a central reporting system for transactions carried out on the market.

Whether multiple platforms prove to be any less effective in stamping out market abuse remains to be seen. Harmonisation is important but may not be enough. Small differences between one regime and another opens the possibility of outright fraud or bizarre exploitation of those differences as we saw by Hungary.

As Derwent noted: "There are some very, very fertile brains trying to think of ways to make something out of differences between procedures."

While cementing over the cracks may stop a rose from growing through the concrete and stop the romantic green collar criminal, the hardcore weeds will always find a way through.



Title: Blooming of the ETS Carousel