

A new direction

A new federal stimulus package marks a new direction in US energy policy.

Page 4



Mixed bag

The financial crisis is producing mixed fortunes for Europe's utilities.

Page 10



Final Word

Junior Isles says Europe's nuclear turnaround has been a long time coming.

Page 16



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IN BRIEF

South America haven

Latin American countries with stable regulatory frameworks could be a haven for energy companies in the current economic climate.

Page 4

Banks may delay Indonesia's power programme

Chinese banks, the main investors in Indonesia's 10 000 MW crash programme, are asking for higher interest rates on loans.

Page 6

Generators call for cash to cut CO₂

Australian power generators say the government needs to provide more money to help the power industry make the transition to emissions trading.

Page 7

Russia boosts nuclear role

Turkey looks set to bring Russia on board as its key partner in the development of a nuclear power programme.

Page 9

Energy Outlook: Crunch time for EU-ETS

The EU Emissions Trading is struggling under the weight of collapsed industrial demand and bearish oil prices. Is it time to reconsider the current market-based approach?

Page 14

Technology: Room to breathe

The rising level of renewables is presenting technical and economic challenges. The answer may lie in the development of an advanced form of large-scale energy storage.

Page 15

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Feasibility of CCS retrofits to be studied

The retrofit of post-combustion capture to an existing plant presents significant challenges. A study to be carried out by EPRI and a group of generators will identify the key areas of concern, writes Junior Isles.

The Electric Power Research Institute (EPRI) announced that five electric utilities in the United States and Canada have joined it to host studies of the impacts of retrofitting advanced amine-based post-combustion CO₂ capture technology to existing coal-fired power plants. In addition to the five host site companies, 15 other companies and organizations, including six from Canada and one from Australia, have joined the project.

As global demand for electricity increases and regulators worldwide look at ways to reduce CO₂ emissions, post-combustion capture (PCC) for both new and existing units could be an important option. However, retrofit of PCC to an existing plant presents significant challenges, including limited space for new plant equipment, limited heat available for process integration, additional cooling water requirements and potential steam

turbine modifications.

Jeff Phillips, senior programme manager for advanced generation at EPRI said: "One of the objectives of the studies is to get a sense of the typical issues that will be faced. I think what we will find for all sites is that it will simply come down to a matter of money. It will not be a case of it being impossible."

The first major challenge is the quantity of low-pressure steam needed

for the process. As much as 50 per cent of the steam that would be used in the LP section of the steam turbine would have to be diverted to the regenerator to release the CO₂. This will be a significant challenge for plants not designed to have such a withdrawal. "This affects almost all existing plants. The challenge is how to do it without losing more steam turbine power than is necessary,"

Continued on page 2

UK rethink on CCS competition may see support for Hatfield

Broadening the UK's carbon capture and storage competition to possibly build more than one project, may see support for the Hatfield IGCC-CCS project planned by Powerfuel, a company owned by mining entrepreneur Richard Budge. Climate change secretary, Ed Miliband, confirmed that he was "hopeful" more than one clean coal power station would be piloted, despite the government running a competition to fund only a single demonstration plant.

Miliband admitted he wanted an expansion of carbon capture and storage projects to bury the greenhouse gases emitted by coal plants but denied reports that he was locked in a battle with the Treasury

over the funding of a wider roll-out.

It is expected that any widening of the competition is likely to see the selection of the Hatfield 1200 MW project as one of the demonstration plants. One industry source said: "While they may not actually name Hatfield, my money would be on Hatfield. It's much larger than the 300 MW demo currently being touted by the government and it's the only project that is ready to go with plans for the transport and storage portion in place. Its location in Humberside is ideal."

The transport and storage portion of any demonstration project is an important aspect. BP's project, which moved to Abu Dhabi after the UK government's decision to support

post-combustion capture ruled it out of the competition, is rumoured to be a year behind schedule due to issues related to the transport and storage part of the project.

Industry executives, who fear a new strategy might delay the CCS demonstration project in a new round of consultations, met the news of a possible widening of the competition with concern.

Three groups are currently left in the competition: one led by Scottish Power, for its existing plant at Longannet in Fife; one led by RWE nPower for a new plant at Tilbury in Essex; and one led by E.On, which is looking to fit its proposed project at Kingsnorth with carbon capture.

One executive from one of the

groups told the *Financial Times*: "There is a very real risk that a new coal strategy will stretch the project out or confuse it."

Meanwhile, E.On Kraftwerke and Siemens announced that they are to build a pilot CO₂ capture plant at E.On's Staudinger power plant in Grosskrotzenburg near Hanau, Germany.

A lab-proven process is to be employed under real operating conditions at the power plant's hard coal fired Staudinger Unit 5. The pilot plant is scheduled to start operation in the summer of 2009. The pilot plant will be operated with part of the flue gas from Unit 5. E.On Kraftwerke and Siemens intend to run the pilot plant until the end of 2010.

Image courtesy of JIS Industrial Services Inc

(Continued from page 1)

noted Phillips.

The second challenge relates to the space requirements of the absorbers, generators and compressors needed for CO₂ capture. Many coal plants, especially in the US have had extensive environmental retrofits, leaving little room for CO₂ capture equipment. "With all the space used up, in some locations we may have to look at putting in extensive exhaust duct diversions that eventually feed back to the stack. It's not impossible but it will incur extra costs," said Phillips. "So one of the things we want to get out of the study is: what is the retrofit premium for CCS compared to if you started with a clean sheet of paper for a power plant already designed for CO₂ capture?" he added.

Phillips conceded that the need for additional cooling might make CO₂ capture almost impossible at some sites. The exhaust itself has to be cooled for the CO₂ capture to operate optimally. The compression of the CO also requires extensive cooling. Phillips explained: "The existing cooling water system may not be adequate to support the retrofit of a capture system. Air cooling is possible but it adds cost."

The study will focus on amine scrubbing since EPRI believes this will return the most accurate cost estimations. It says the technology exists at a size that can be extrapolated to the size of a full-scale coal plant. "There is also work going on with promising technologies like chilled ammonia but these are too small scale to extrapolate to full-scale. We have more accurate information on the capital costs of amine scrubbing plants," added Phillips.

The five host companies and sites include Edison Mission Group's 1536 MW Powerton Station, operated by Midwest Generation, in Pekin, Ill.; Great River Energy's 1100 MW Coal Creek Station in Underwood North Dakota; Nova Scotia Power's two 160 MW units at its Lingan Generating Station in Lingan, Nova Scotia; Intermountain Power Agency's 950 MW Intermountain Generation Station in Delta, Utah, and the 176 MW circulating fluidized bed boiler Unit 1 at FirstEnergy's Bay Shore Plant in Oregon, Ohio.

Each site offers a unique combination of unit sizes and ages, existing and planned emissions controls, fuel types, steam conditions, boilers, turbines, cooling systems, and options for CO₂ storage. In the first step, the utilities will give EPRI access to plant design drawings to assess the most practical CO₂ capture efficiency configuration based on site constraints; determine the space required for the CO₂ capture technology and the interfaces with existing systems; estimate performance and costs for the PCC plant; and assess the features of each plant that materially affect the cost and feasibility of the retrofit.

The five studies will be conducted in 2009 and the first report should be available by the middle of the year. All of the results should be available by the middle of next year.

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Nuclear U-turn spreads across Europe

Key developments in Europe last month demonstrate that the nuclear revival is a reality, writes Junior Isles

Maud Olofsson: "...can live with nuclear power..."

Sweden and Italy are making a concerted effort to re-start their nuclear power industry more than two decades after both countries took the decision to ban nuclear power.

The turnaround demonstrates how countries are changing their attitude to nuclear power, with many now regarding it as a potential solution to concerns over carbon dioxide emissions, high fossil fuel prices and dependence on imported energy sources.

In early February, the Swedish four-party coalition government announced that the country would revoke a 1980 referendum decision to phase out nuclear power and would build new nuclear power plants to replace old ones.

Sweden has closed two old nuclear power plants since 1999. There are currently 10 nuclear power plants in the country, which produce about half of the country's electricity.

The Swedish government said its

new position on nuclear power aimed to reduce the country's dependence on fossil fuel and to cut greenhouse gas emissions.

The agreement was made possible after a compromise by the Centre Party, a junior coalition member that has long been sceptical towards nuclear power.

"I'm doing this for the sake of my children and grandchildren," said party leader Maud Olofsson. "I can live with the fact that nuclear power will be part of our electricity supply system in the foreseeable future."

The government said it aims to reduce greenhouse gas emissions by 40 per cent by 2020, compared to 1990 levels, partly by expanding wind power and raising taxes on fossil fuels. Its energy plans calls for renewable energy to account for 50 per cent of Sweden's energy in 2020. Today that figure is roughly 40 per cent, one of the highest in Europe, mostly because of hydropower.

Swedish public opinion polls have

shown growing support for nuclear energy in recent years because of the lack of alternatives.

A poll, conducted February 5-11th by the polling firm Synovate, showed that 62 per cent of the respondents support the government's energy policy to build new nuclear power plants, while 28 per cent opposed the plan.

Sweden joins a growing list of countries rethinking nuclear power as a source of energy amid concerns over global warming and the reliability of energy suppliers such as Russia. Britain, France and Poland are planning new reactors and Finland is currently building Europe's first new nuclear plant in over a decade at Olkiluoto.

Last month power utility Fortum also submitted to the Finnish government an application for a decision-in-principle concerning the construction of another nuclear power plant unit on the island of Hastholmen in Loviisa, Finland.

More recently France's EDF and

Italy's Enel said they were ready to re-launch Italy's nuclear industry after an accord was signed between French president Nicolas Sarkozy and Italian premier, Silvio Berlusconi. A referendum in 1987 saw Italy ban nuclear power.

It is rumoured that Enel would be a majority shareholder in a consortium with EDF and that a later phase could bring in other shareholders including Edison and industrial power consumers.

Italian minister for economic development, Claudio Scajola, said the accord would cover "all aspects of nuclear power" including technical co-operation. The Italian parliament is expected to approve a bill setting out the country's nuclear strategy this month.

Meanwhile, in Germany the Christian Democratic Union party is expected to campaign in this year's election with a commitment to save reactors from their planned closure.

China maps out massive spending plan

■ Spending package part of economic stimulus
■ Plans for investment in wind, nuclear and solar power

China will invest 580 billion yuan (\$85 billion) to expand its energy industry in 2009, with a heavy focus on adding more nuclear and wind-powered generating capacity, according to state media.

Chinese power companies stepped up investment in November as part of the government's 4 trillion yuan (\$586 billion) stimulus plan. A large share of spending for the package is due to come from state-owned companies to meet growing demand and help boost economic growth.

Plans call for investment in wind,

nuclear and solar power, as well as expanding coal fired generation. China will build eight more nuclear plants with a total of 16 reactors over the next three years, the *China Daily* newspaper said.

The country has 11 nuclear reactors supplying about 1 per cent of its power, and Beijing wants to raise that share to 5 per cent.

The Chinese Wind Energy Association (CWEA) recently outlined the layout and construction of six 10 000MW wind power bases in Inner Mongolia, Xinjiang, Gansu, Hebei, and Jiangsu.

At the end of 2008, the country had an installed wind power capacity of 10 000 MW, ranking fifth in the world. This is expected to reach 30 000 MW by 2011 and 80 000 MW in 2020.

China's clean technology sector received a boost in late January when the Asian Development Bank (ADB) agreed to provide three technical assistance grants totalling \$2.8 million dollars to support efforts to reduce sulphur dioxide gas emissions, increase energy savings, and strengthen a fund that supports clean energy projects, the Manila-based bank said in a statement.

To support the Chinese government's target of cutting sulphur dioxide emissions by 10 per cent between 2006 and 2010, an ADB technical assistance grant of \$500 000 dollars will be used

to design and implement a national emissions trading system. This will provide a financial incentive to companies to curb emissions and complement other government measures to reduce air pollution.

ADB will also provide technical assistance totalling \$1.5 million dollars to support the government's goal of making energy savings of 20 per cent by 2010. It will be used to look at steps needed to attract international financial institutions to invest in energy efficiency and conservation projects. The assistance will also help improve the scheduling of power generation by giving higher priority to zero- and low-carbon dioxide emitting power plants.

■ Energy demand in China will continue to slow during the first half of 2009 but will pick up in the third quarter, industry officials said. "Power demand is likely to see a continuous decline in the first half," the China Electricity Council said in a forecast released last month. "The first two quarters will be the most difficult time for the industry." The lagging demand for power is largely a result of lower energy consumption by industries.

"Bad news for carbon permits"

Prices for carbon-emission permits may remain near record lows until at least 2011 because of stalled demand from polluting industries and governments, according Fatih Birol the International Energy Agency's chief economist.

Birol said many countries have lost interest in forcing companies to pay to release greenhouse gases to stem climate change as coping with the recession and credit crunch take precedence. Ending the credit crisis and recession dominate agendas of

governments that had planned to expand carbon-emission caps to slash greenhouse-gas emissions blamed for climate change.

Lack of financing has delayed or killed about one-quarter of pending energy projects, particularly to build power plants, Birol said.

"This is bad news for carbon permits," he said. "There is a weakening of the climate-change issue and this is not good news as we are coming up to the Copenhagen meeting."

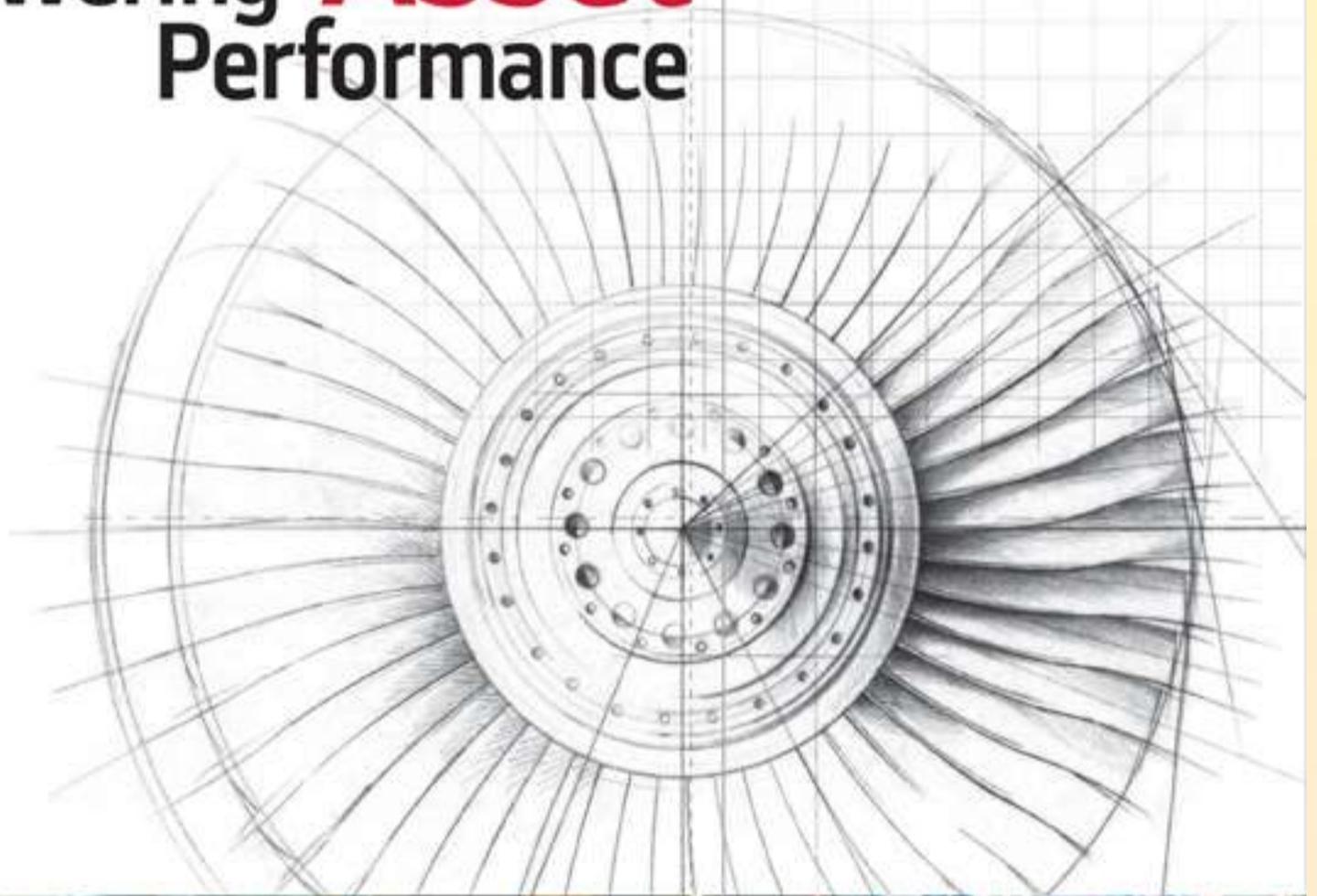
The United Nations has called on 192 countries to negotiate a new climate-protection treaty to be signed at the end of this year in Copenhagen. The UN wants a new agreement ready to take effect after 2012, when carbon-emission limits expire for 37 countries under the existing Kyoto Protocol climate treaty.

In February, EU carbon dioxide allowances on the European Climate Exchange in London traded at a record low of around €9 to release 1 tonne of CO₂. This compares to a

high of €30.90 per tonne, on July 2, 2008.

* At the end of January the European Commission proposed to reallocate €5 billion of unspent EU money, mostly to support clean coal projects, offshore wind farms. Presenting the plans on, EC president José Manuel Barroso said the projects would represent a "smart investment" for the EU as it battles a deepening economic downturn. Under the plans, a total of €3.5 billion will be devoted to clean energy projects.

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Dr Steven Chu:
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ARRA heralds new energy era for USA

President Obama's federal stimulus package marks a new direction in US energy policy, but more long-term clean energy policies are needed, writes Siân Crampsie.

The passage of the American Recovery and Reinvestment Act (ARRA) into law and a stark warning on the impacts of global warming from US Energy Secretary Dr. Steven Chu are the latest indications of the new US administration's determination to create a new energy economy.

Signed into law by President Obama on 17th February, ARRA is ostensibly designed to kick-start the USA's ailing economy yet its provisions could bring about the most significant change in the country's energy industry.

The legislation has been praised by the renewable energy industry, which has also called on the government to continue its commitment to the clean energy sector through long-term policies.

ARRA is a \$787 billion package of tax incentives and federal spending plans that Obama believes will create more than 3.5 million jobs over two years and "ignite spending by businesses and consumers alike". It comes as the Obama administration works on the preparation of a new energy bill as well as climate change legislation.

Obama has put clean energy technologies and climate change at the heart of his energy sector agenda, marking a new direction for energy policy in the US. ARRA will double

the amount of renewable energy produced over the next three years and leverage nearly \$100 billion in clean energy projects, according to the White House.

Dr. Chu gave an indication of how seriously the Obama administration views climate change in his first interview since taking office. He said that education would play an essential part in the success of government policies as the American public has not yet "gripped in its gut" what the impacts of global warming will be.

The renewable energy provisions of the ARRA stimulus package include a three-year extension of the Production Tax Credit (PTC) to the end of 2012, several energy efficiency programmes, a green jobs training programme and investment in the nation's transmission grid. It also includes an option for project owners to claim a 30 per cent investment tax credit in lieu of the PTC and a new grant programme to help project owners to monetize their renewable energy tax credit during the current economic crisis.

These last two provisions will be essential for the stimulation of short-term investments in the current economic climate, according to Danish wind turbine manufacturer Vestas, which has warned that it may have to make possible job losses in

spite of posting strong annual results.

"We highly welcome the provisions of the stimulus bill related to renewables and wind energy," said Vestas President and CEO Ditlev Engel. "This is exactly the kind of action and short-term follow up from the new administration we have been calling for. It is a good first step for the changes which are needed in the American electricity sector in order to have more energy independence and a cleaner energy production."

The legislation was also praised by the Solar Energy Industries Association (SEIA), which said that the strong solar provisions in the bill would help to create 60 000 jobs in the solar industry in 2009 alone and a total of 110 000 in the next two years.

SEIA also called on Congress and the government to implement long term policies in order to help sustain the momentum of the clean energy economy. Obama is aiming to implement a 25 per cent renewable energy mandate and legislation designed to boost renewable energy use is currently being drawn up.

But in spite of the boost that the legislation will give to the renewables sector, a slowdown in growth in the industry is still expected, according to Emerging Energy Research (EER), a Massachusetts-based consultancy.

EER says that although the US wind power industry experienced record growth in 2008 with 8358 MW installed at year-end, a significant decline will be seen in 2009 due to the curtailment of project and tax equity financing in the current economic climate. Another major factor constraining growth in the US wind power industry in coming years will be the inadequate and ageing infrastructure.

With none of the country's planned large-scale transmission initiatives expected to come online between 2008 and 2012, annual growth in the US wind market may stall at 8-9 GW per year according to EER. "The inability of transmission build-out to keep pace with wind project development activity will increasingly constrain the growth of the US wind power market in the near-term," said EER senior wind analyst Matthew Kaplan.

However, the federal stimulus package has earmarked \$11 billion to expand and upgrade the US transmission grid. The act also directs the Department of Energy to determine whether significant potential sources of renewable energy are being denied access to the market by inadequate transmission infrastructure, and then to provide recommendations for overcoming these barriers.

US initiatives jump-start CCS

A wide range of projects and state and federal-level initiatives are driving development of clean coal and carbon capture and storage (CCS) technologies in the US.

Pennsylvania has become the latest US state to propose legislation in support of clean coal technology, while CCS was given a major boost by the recently-passed federal stimulus package.

The initiatives will help to improve the country's energy security while keeping a lid on carbon emissions, say clean coal proponents. Environmentalists are more sceptical about the prospects of CCS and other clean coal technologies.

Pennsylvania plans to follow in the footsteps of states such as Illinois, Texas, North Dakota and Kansas, all of which have either introduced or passed CCS legislation in the last four months. The state's lawmakers want to build a state-run carbon storage facility, and also require Pennsylvania utilities to produce three per cent of their electricity from CCS-equipped facilities.

Other projects in the pipeline include one to equip coal fired power plants in Saskatchewan, Canada with carbon capture equipment and pipe the carbon to Montana, USA for underground storage. The developers of the FutureGen project in Illinois are also hoping that they will win the support of the new US administration.

President Obama is a supporter of clean coal technology and has indicated that he wants to build five CCS demonstration plants. The federal stimulus package will increase federal CCS support in the US by 70 per cent to over \$8 billion.

Such support is critical to the development of CCS, says consulting firm Emerging Energy Research (EER).

"If coal is to maintain its share in the global power generation mix over the next two decades, its carbon emissions must be mitigated through the capture of CO₂," said Alex Klein, EER Research Director. "While sequestration solutions have been demonstrated on a trial basis, carbon sequestration's commercial viability on a broad scale can only be established by the projects this [federal] money will support."

Klein added: "The fact that individual states have begun to take the lead in CCS policy creates an even greater mandate for these demonstration projects."

In Illinois, the Clean Coal Portfolio Law (CCPL) has made that state the first to create a portfolio standard requiring utilities and power retailers to get electricity from coal plants with CCS. In Texas a proposed \$100 million in franchise tax credits per plant may be available to developers of IGCC facilities that capture and sequester at least 60 per cent of their CO₂ emissions.

South America offers haven

- Improved utility financials
- Jirau secures BNDES loan

Madeira River, Brazil:
location for the Jirau
hydropower project

Latin American countries with stable regulatory frameworks such as Brazil could prove to be a haven for energy companies with a presence in the market.

The reduced debt and improved liquidity positions of many of the region's power companies in recent years will help them to withstand the current credit conditions, while continued rising electricity demand and government-backed infrastructure programmes will help to maintain growth.

A recent report from ratings

analyst Fitch says that although the Latin American electric power sector is not totally immune to the world's economic challenges, countries such as Brazil and Chile are in a good position. Analysts believe that the market conditions could lead to a wave of M&A activity in the region between local as well as international firms.

International firms active in Latin America include GDF Suez, AES, Energias do Portugal (EDP), Endesa and Iberdrola.

In Brazil, the global credit crisis

and a weaker Real have lowered the share prices of utilities, making them potential targets.

In addition to building some major hydropower projects in Brazil, GDF Suez is continuing its expansion in renewable energy in Latin America through wind power developments. It recently started construction of the 38 MW, \$210 million Monte Redondo wind farm in Chile, while its Brazilian subsidiary is due to commission the 18 MW Pedra so Sal wind farm in Brazil.

The French utility giant was in

February granted a \$3.1 billion financing package for the 3.3 GW Jirau hydropower project by Brazilian development bank BNDES. It is building the project on the Madeira River as part of the ESBR consortium, which also includes Chesf, Eletrosul and Camargo Correa.

Other investments in Brazil by GDF Suez include the 19.8 MW Areia Branca hydroelectric plant, the 25.6 MW Beberibe wind farm, and the 1087 MW Estreito hydropower plant.



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“Crippling” shortages offer investment opportunities

While impending power shortages may be delayed by the economic crisis, the need for new projects will offer opportunities for the private sector, writes Syed Ali

The Luzon Island grid will need 3000 MW of new capacity by next year

Power shortages expected in 2010 in the Philippines are being seen as an opportunity for private investors. Philippines Chamber of Commerce and Industry (PCCI) vice president for energy and utilities Jose S. Alejandro

warned that the country urgently needs to build 5000 MW of new capacity between now and next year in order to avert crippling power outages when the economy is expected to recover. “The impending power shortages

may be delayed due to the deepening economic crisis that may stunt growth in electricity demand. But energy officials must take the lead-time to bid out and start building those multi-billion dollar power plant projects,”

Alejandro said.

“They should look at the challenge as an opportunity to attract new foreign and local direct investments,” he pointed out.

An in-depth study made by the Alejandro committee to guide PCCI in its advocacy for cheaper and more dependable power supply noted that the Luzon grid will need 3000 MW of new generating capacity by next year.

It said that the 608 MW of capacity that the energy department claimed was committed for construction is not there. Committee members also observed that the intermittent brownouts in Luzon are symptoms of the dwindling reserve capacity.

The situation in the Visayas is more acute, the committee pointed out in the PCCI Energy Roadmap report. Consumer demand for electricity outstripped supply last year. The region immediately needs 500 MW to prevent the now regular power outages from reaching disastrous levels.

In Mindanao, the critical period is this year, when brownouts are expected to start as demand for power will overtake the generating capacity of existing plants. The region also needs investment for a 600 MW plant. Recently, both domestic and

international companies have expressed interest in developing projects.

San Miguel Corp., Southeast Asia’s largest food and drink group, is diversifying further in the utilities sector as it eyes a \$1 billion project in the water distribution business.

In a disclosure to the Philippine Stock Exchange, San Miguel said its wholly-owned unit San Miguel Bulk Water Co. Inc. (SMBWCI) submitted an unsolicited proposal for the joint development of the Laiban Dam project located in Tanay, Rizal.

The dam reportedly has the potential to supply 1900 million litres/day of water to consumers in the metropolis and is also expected to contribute some 153 MW to the Luzon power grid.

In mid-February, Deep Ocean Power Philippines, a unit of California-based Deep Ocean Power, said it is currently conducting studies on at least 36 sites for possible ocean power sources.

A US Department of Energy (DOE) source said the sites are located in Laoag, Zambales, Mindoro, Isabela, Panay, Negros and parts of Mindanao. Ocean energy resources are abundant in the Philippines with a reported potential generating capacity of around 170 000 MW.

Chinese banks may delay Indonesia ‘crash programme’

■ Banks request higher loan interest rates

■ PLN secured \$5.5 billion

Chinese banks, the main investors in Indonesia’s 10 000 MW crash programme, may be responsible for delaying the programme, according to state power company, PT PLN.

PLN’s president director Fahmi Mochtar said the banks committed to financing the programme have now requested higher loan interest rates than those agreed during the contract agreement last year.

“The problem is, the progress of this project pretty much depends on the smoothness of the financing flow. With this delay, some work might also be delayed,” Fahmi said.

The consortium of China’s banks includes the Bank of China, the China Development Bank and the China Export Import Bank. The three banks have agreed to provide PLN with loans amounting to about \$1.48 billion.

Fahmi said that part of this financial commitment has been disbursed but the banks have asked to renegotiate the loan interest on the remainder of the finance required.

He added that aside from ongoing projects, PLN was also in negotiation with several banks in China with a view to financing other projects within the programme. The banks also want



Fahmi Mochtar: is depending on “smooth financing”

higher loan interest for upcoming projects.

“PLN and the government are discussing what we can propose to China. Therefore, the projects would not necessarily be delayed,” he said.

The 10 000 MW programme launched in 2006, is planned to be completed by 2011 and calls for \$8 billion in total. This figure is the accumulation of all required funds denominated in rupiah and in US dollars.

Fahmi said domestic banks could represent PLN’s source of final recourse for financing, but he quickly

added that the local banks’ capacity for lending foreign currency might not be sufficient.

At the end of January, PLN concluded a Rp4.30 trillion (\$378.27 million) loan deal from domestic banks to finance five coal-fired power plants, which are part of the programme. The deal means PLN has now secured \$5.5 billion, around 65 per cent of the total financing needed.

Meanwhile, PLN recently met with the Malaysian Ministry of Energy, Water and Communications discuss the possibility of importing power from Malaysia to Sumatra.

IPPs bid in Pakistan despite credit crunch

Three qualifying bidders for three independent power producer (IPP) power projects will be issued Letter of Support (LOS) by early March, with commissioning expected by 2010/11.

The Private Power and Infrastructure Board (PPIB) recently received three bids for 964 MW of fast-track power projects requiring an investment of \$1.16 billion.

A total of 16 parties procured the Request for Proposals (RFP) and at the end of January, three parties – 627 MW Engro PowerGen (Pvt) Limited at Bhikki near Sheikhpura, 171 MW Saba Power Generation (Pvt) Limited near Lahore, and 166 MW Reshma Power Generation Limited at Jhang – submitted bids.

Managing Director PPIB Fayyaz Elahi said: “We have received an encouraging response despite the global economic crunch.”

Mr Elahi said a two-envelope approach had been adopted for bidding: the first envelope of the bids containing both ‘technical and financial qualifications’ which were opened at the end of January would be followed by the tariff bids (envelope-II) which would be opened after evaluation of technical and financial qualifications of the bidders.

The bids are a consequence of the ‘Fast Track Private Power Projects’ initiative of the government, the initial phase of which has already resulted in project solicitations of 780 MW of rentals expected to come on line by the end of 2009, and a fast track 172 MW IPP project to start by mid-2010.

By the end of this year, the government plans to add 4002 MW to the country’s power system, which suffers an average shortfall of around 3500 MW on a daily basis.

Pakistan needs to generate an additional 16 000 MW by 2015 to alleviate the worst of its current electricity load-shedding. This will require \$30 billion in investment, including \$20 billion from the private sector. The country’s domestic power consumption is growing at an annual rate of 6 to 8 per cent.

Areva deal paves way for India’s nuclear future

A deal between French nuclear giant Areva and Indian electric utility Nuclear Power Corporation of India Ltd. (NPCIL) for the supply of up to six nuclear reactors marks the first commercial agreement since the International Atomic Energy Agency (IAEA) gave the go-ahead for the international community to trade nuclear technology with India.

Areva says the deal signed with NPCIL paves the way for technical cooperation on at least two and as many as six of Areva’s 1600 MW EPRs at the Jaitapur site in the western state of Maharashtra.

While Areva did not state the value of the deal, it is estimated that it could be worth more than €8 billion. The company said discussions would now begin on pricing and timing for the new reactors and a final contract could be signed by the end of the year. This means that the first reactor could be operational by 2016.

Indian officials said the deal marked the start of a wide-ranging future collaboration on nuclear issues between the two countries. “This is just the beginning,” said Anil Kakodkar, Chairman of India’s Atomic Energy Commission (AEC).

The deal follows the conclusion of a landmark agreement between the United States and India, which opened the way for nuclear trade between India and other nations. Previously, India had faced a nuclear trade ban since its first atomic test in 1974 and subsequent refusal to sign international treaties designed to limit the illicit spread of such materials.

India has already inked deals with Russia to build new nuclear plants but the deal with Areva is the first commercial agreement since the IAEA announcement. In late January,

India also signed deals with Areva and KazAtomProm of Kazakhstan for importing natural uranium.

Power shortfalls mean that many cities suffer frequent power outages. Prithviraj Chavan, minister in the prime minister’s office responsible for nuclear issues said India needs to quadruple power generation by 2032 to maintain economic growth.

Today, India generates just 3 per cent of its power from nuclear. By 2032, the government plans to increase the country’s total installed capacity to 700 GW, with nuclear accounting for 63 GW. This means the addition of up to about 40 new nuclear reactors worth some \$80 billion, according to NPCIL chairman Shreyans Kumar Jain. NPCIL already has five reactors under construction, which will add 2660 MW to its current 4120 MW capacity. It operates all of India’s 17 existing nuclear reactors.

Australian generators call for cash to cut CO₂

Australian power generators say the government needs to provide more money to help the power industry make the transition to emissions trading.

The federal government plans to provide A\$4 billion (\$2.54 billion) to heavy-emitting industries under its planned carbon pollution reduction scheme, due to begin by July 2010. But a group representing fossil fuel generators has told a Senate inquiry hearing in Canberra the amount is not enough.

The level of assistance must meet industry's expected asset value loss, the National Generators Forum said. "Treasury modelling... is optimistic in its assumptions about the potential impact on existing assets," executive director John Boshier told the hearing.

The forum says assistance must be provided to industry for at least a decade.

The Energy Supply Association of Australia says the industry emits around 200 million tonnes of greenhouse gases per year. It estimates an emissions trading scheme (ETS) will cost about A\$55 billion over 10 years.

The association's acting chief executive Clare Savage said energy supply would face major challenges unless more money is made available. "There is a risk of short-term financial distress, and premature retirement of plants," Ms Savage told the Senate inquiry hearing. "In the medium to longer term there's a risk of threat in the investment environment."

The government must also deregulate energy pricing so companies can pass on the costs to consumers, Ms Savage said. "If retailers are unable to pass on the full cost of supply then you can't expect them to remain profitable."

Australia's carbon pollution reduction scheme aims to cut emissions by five per cent by 2020. If other nations come on board, the government will consider extending the targets to 15 per cent.

The federal government is expected to introduce legislation setting up the scheme to parliament in May.

Bangladesh outlines new capacity strategy

The government has initiated work on a three-pronged strategy to boost electricity generation to meet the growing demand for power across the country.

Under a short term plan the government has taken steps to increase add 700 MW to the national grid by December 2009.

In the medium term a 300 MW peaking power plant will be installed at Shidhhirganj. The tender was floated in January and the last date for bid submission has been set for March 23, 2009.

Another 360 MW combined cycle power plant will be installed at Haripur. The tender will be floated in June.

Signing of contracts with the successful bidders is expected to be complete by September 2009 and electricity generation will start from 2012.

South Korea green investment

The Republic of Korea has announced a comprehensive strategy regarding green energy development that includes investment totalling 6 trillion won (\$4.37 billion) over the next four years.

The plan aims to close the technology gap with other advanced countries, according to the *Korea Herald*.

"The government, together with the private sector, plans to invest 6 trillion won in the next four years. The project will be led by the country's major companies like Samsung, Hyundai and LG," Vice Energy Minister Ahn Chul-shik said recently.

Under the plan, the government and 73 local companies will support green energy projects in 15 key sectors, to develop their technology to a comparable level to advanced

countries and to eventually create a new market for the industry.

The sectors include solar and nuclear energy sectors, wind power, greenhouse gas absorption, high tech energy storage and batteries.

The green energy initiative is part of the government's plans to shift the country's industrial focus in the future.

Earlier in January it announced a 'Green New Deal' project with a view to creating some 960 000 new jobs by investing 50 trillion won over the next four years. The private sector, meanwhile, said it would invest 3.1 trillion won in the clean energy sector this year, up 66 per cent from 2008. Companies claim the move could help create 3200 new jobs.

The government also said that it plans to set up a 100 billion won

The government and local companies are planning massive investment in green energy projects to close the technology gap with advanced countries and create a new market for the industry.

(US\$72.2 million) renewable energy fund this year to bolster South Korea's clean energy production infrastructure.

The fund will be used to attract private sector investments in solar, wind and hydroelectric power generation technologies and construction of new facilities, the Ministry of Knowledge Economy said.

As part of this plan, the government will work alongside local administrations to build 26 indigenous wind power generators on both the east and west coast this year. Construction of the turbines, which could generate a combined 24 MW, are expected to help local companies win future orders in the domestic market which has been dominated by foreign suppliers. Of the 146 wind turbines in the country, only one was

made locally.

The ministry in charge of the country's industrial and energy policies also said that feasibility studies are to be conducted for construction of a 40 MW wind farm on the Saemankum reclamation site.

Other projects include eight small hydroelectric power plants on four rivers slated for development to strengthen the country's ability to deal with floods and drought. The ministry also said it will start construction of a biofuel plant scheduled for completion in 2013, while 16 000 energy-efficient green homes are to be built this year.

Exports of renewable energy technologies and products stood at \$1.2 billion last year. Seoul wants to raise this to \$2.2 billion this year.

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Poland seeks EU funding for pioneering CCS plant

In spite of objecting to the EU energy and climate package, Poland is looking to take advantage of the prospect of funding for carbon capture and storage (CCS) demonstration projects, writes Siân Crampsie.

Poland is moving forward with plans to make its coal-dependent economy more environmentally-friendly with a project to build what it is calling the world's first zero-emission power and chemical plant.

The country was one of the most vocal objectors to parts of the European Commission's energy and climate legislative package, but now two of its companies are planning to apply for EU funding for a project involving the construction of a coal gasification plant equipped with carbon capture and storage (CCS) technology.

The project will give a further push to efforts in the region to commercialize CCS and clean coal technology, which the European Commission sees as a key part of plans to reduce greenhouse gas emissions and improving energy security. A number of major energy firms have already announced plans for projects

demonstrating CCS technology on a pilot scale, but few have made any concrete commitments to commercial-scale ventures.

Behind the project are chemicals producer ZAK and Polish utility PKE, who are planning to use state-of-the-art technology to turn coal into synthetic gas, which can then be used to generate electricity or converted into chemicals. The firms have stressed the importance of the technology not only to coal-dependent countries such as Poland, but also to countries in Europe that are heavily dependent on imports of Russian gas.

Coal accounts for over half of energy supplies in Poland, and for around half of electricity generation.

The proposed plant would be located in Upper Silesia and the carbon that it produced would be captured and stored underground. The storage of the captured carbon could be undertaken jointly with the Czech

Republic, say PKE and ZAK.

The project has the political backing of Poland's government and the project sponsors are keen for it to be included on a list of up to 12 EU-funded CCS demonstration plants. ZAK and PKE say they are interested in bringing other partners on board in order to benefit from wider experience of the technologies to be used.

The EU funding could cover as much as half of the €1.3 billion project costs. The EU recently agreed that financial support of CCS demonstration projects is essential for the commercialization of the technology.

In December 2008 Alstom signed a memorandum of understanding with PGE Elektrownia Belchatow S.A. to demonstrate CCS technology at a plant in Poland as part of its plans to commercialise the technology. The project – another candidate for EU funding – will use Alstom's advanced amine scrubbing technology, which it

is developing in conjunction with The Dow Chemical Company.

In the first phase of the project, Alstom will design and construct a pilot carbon capture plant at the existing unit 12 of Belchatow power plant. During the second phase, Alstom and Elektrownia Belchatow will build a larger CCS plant at the new 858 MW lignite-fired unit currently being built by Alstom for Elektrownia Belchatow.

To qualify for EU funding, these proposed projects should be operational by 2015.

The EU demonstration programme aims to reduce the risk for companies involved in CCS technology development and to make the technology commercially viable by 2020. The EU has also endorsed a regulatory framework for CCS technology as part of the energy and climate package.

Funding for the CCS demonstration project will come from 300 million allowances from the EU's Emissions Trading Scheme (ETS).

Other recently announced CCS projects include plans by E.On and Siemens of Germany to build a pilot CO₂ capture plant at the Staudinger

Gerhard Seibel: E.On technical director



power plant near Hanau. Scheduled to start operating in mid-2009, the facility will use a scrubbing process developed by Siemens to remove carbon from the flue gases of Staudinger Unit 5.

"As a major contribution toward climate protection E.On is planning industrial-scale CO₂ capture and storage for coal-fired power plants starting in 2020. Operation of this pilot plant together with Siemens is a major step in this direction," said Gerhard Seibel, Technical Director responsible for new units at E.On Kraftwerke.

Michael Suess, CEO of the Fossil Power Generation Division of Siemens Energy commented: "The results achieved and the operating performance of the pilot plant will serve as the basis for large-scale

Progress on energy policy

■ Ambitious targets proposed

■ Energy efficiency seen as key

The adoption of two new reports by the European Parliament indicates that the 27-nation bloc will continue to shape its energy policy and make tackling climate change a priority.

MEPs have backed proposals to increase targets for renewable energy and for deeper cuts in greenhouse gas emissions contained in two reports drawn up by French MEP Anne Laperrouze and German MEP Karl-Heinz Florenz, respectively. The reports come in the wake of the publication last year of the European Commission's Second Strategic Energy Review, which sets out a vision for Europe's future energy policy.

The report by Laperrouze proposes setting a 60 per cent renewable energy target and an energy efficiency goal of 35 per cent. Florenz's report highlighted the job opportunities that would be created by a shift away from fossil fuels and an 80 per cent cut on 1990 levels in greenhouse gas emissions by 2050.

The Florenz report proposes an interim goal of a 25-40 per cent cut



French MEP Anne Laperrouze: helping to shape energy policy

in emissions by 2020. It also asks EU member states and institutions to support research and development in energy technologies such as hydrogen, electric, fuel cells, hybrids or advanced biofuels, and calls for greater energy efficiency in the buildings sector.

Florenz said: "The buildings sector is where we still have the most serious shortcomings as regards energy efficiency. If we put

emphasis on classical building insulation and the intelligent use of sunlight, we will be able to create huge savings at relatively low costs."

In adopting the reports, MEPs have called for climate change to be prioritized in the EU's financial framework, and also for the development of an EU-wide 'supergrid' accessible to all forms of generator.

GDF Suez joins Iberdrola partnership

■ Joins EDF in French EPR project

■ UK opens site nominations

GDF Suez will fulfil its ambitions to gain a foothold in the UK's nuclear power sector through an industrial partnership with two other European utilities.

The French utility was at one point in 2008 thought to be interested in purchasing UK nuclear generator British Energy, but has now announced that it will participate in the development of new nuclear power stations in the UK with Spanish firm Iberdrola and Scottish and Southern Energy (SSE).

The news follows the formation of a similar partnership by German utilities E.On and RWE. GDF Suez is also planning to participate in the construction of a second EPR reactor in France in conjunction with EDF.

The creation of industrial partnerships by major utilities for the UK's new build programme indicates the scale of the task and the potential risks that they face. EDF, which in January completed its purchase of British Energy, says it will build at least four EPR-based power plants in the UK, while E.On and RWE say that they want to build at least 6 GW of new nuclear capacity.

Iberdrola and SSE first created their partnership in January and indicated that, like E.On and RWE, they would not be tied to any one equipment vendor for their planned nuclear projects. However, the entry of GDF Suez to the partnership is likely to result in a preference for EPR technology.

It has also made SSE a minority partner in the enterprise.

In France, EDF is to lead a project to construct a second EPR plant in the north of the country. GDF Suez will be one of EDF's partners in the project,

which will be located at Penly in Seine-Maritime.

Construction of the project will start in 2012. EDF is currently building an EPR reactor at Flamanville in northern France but the project is over budget and behind schedule.

GDF Suez, Iberdrola and SSE say that they will bid for nuclear sites being auctioned off by the UK's Nuclear Decommissioning Authority (NDA). The NDA has initiated the sale of three sites around the UK, and is aiming to announce the winning bidders by the end of March.

The UK government announced plans for a new nuclear build programme in early 2008 and wants to see the first reactor on-line by 2020. It has been praised by EDF for the progress being made on the development of the framework for investment in new nuclear build.

The government's Department of Energy and Climate Change (DECC) recently invited companies to nominate potential sites for new nuclear build, and also published the criteria against which nominated sites will be assessed.

"We've taken some big steps towards next generation nuclear in the year since the publication of our White Paper," said Energy and Climate Change Secretary Ed Miliband. "The industry continues to gear up to invest and we are on course to see new nuclear feeding into the grid by 2018."

Nuclear power can improve energy security and help the drive towards low carbon energy supplies. Alongside renewables and cleaner fossil fuels, it will help us meet our climate change goals as well as ensuring the future supply of energy for the UK."

Russia boosts nuclear role

- Government eyes major deal with Turkey
- Siemens lines up Rosatom partnership

Siân Crampsie

Turkey looks set to bring Russia on board as its key partner in the development of a nuclear power programme that is designed to boost generating capacity and enhance security of supply.

The Turkish and Russian governments are reportedly close to reaching agreement on a billion-dollar deal that would see a Russian government-backed consortium constructing up to four new nuclear reactors in Turkey. Closure of the deal would be a major boost for Russia's atomic energy industry and would reinforce Turkey's plans to establish a nuclear power sector.

It would also be a boost for Russia's position on the world energy stage as its government continues to seek trade deals with countries around the world.

Plans for the agreement were discussed at a February meeting between Russian Energy Minister Sergei Schmatko and Turkish president Abdullah Gul in Moscow, according to local reports. The two countries have also discussed the possibility of a long-term power supply contract. News of the proposed deal came as

Turkey's state-run power company Tetas said that a Russian-led consortium had revised its bid to build Turkey's first nuclear power plant.

The Turkish-Russian deal would involve construction of four 1200 MW reactors by Atomstroyexport and its partners. The Russian consortium could also operate the power plants, bringing the total value of the deal to as much as \$60 billion over 15 years.

Turkey wants to develop a nuclear power industry in order to reduce its reliance on foreign energy imports and boost capacity to meet growing demand. It wants atomic energy to cover 20 per cent of the nation's electricity needs by 2030.

A consortium of Atomstroyexport, Inter RAO and Turkey's Park Teknik recently revised its offer for the construction and management of Turkey's first nuclear power plant to €15.35/kWh, down from €21.16/kWh. The consortium was the sole bidder in a tender that was held in September 2008.

The revised bid will now be assessed by Turkey's Atomic Energy Agency (TAEK), according to Tetas.

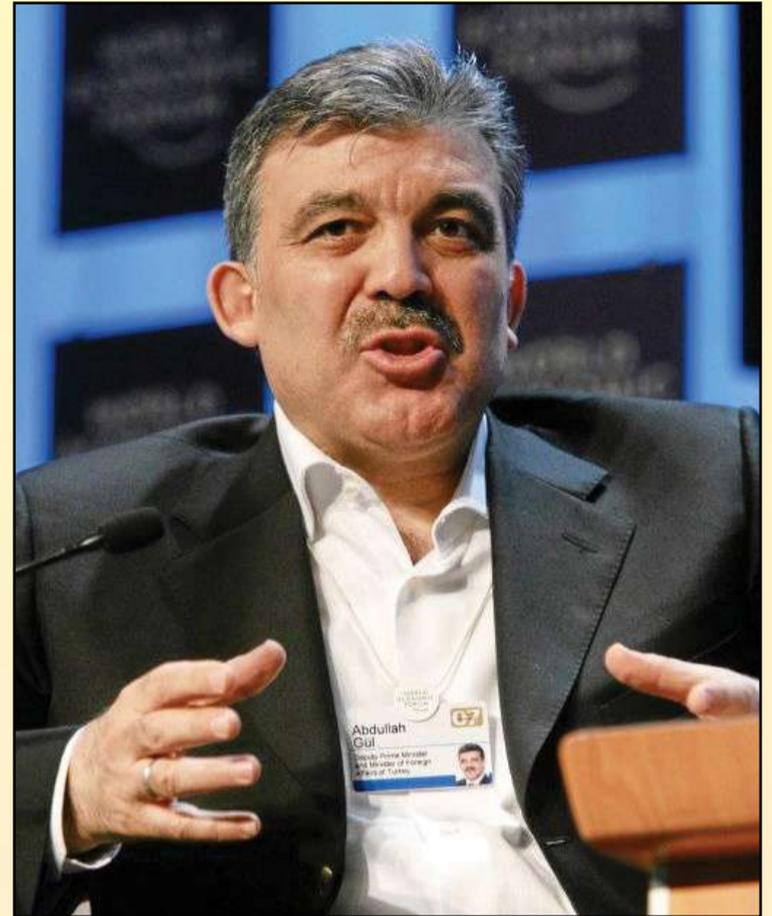
Russia is also seeking to strengthen its ties with a number of other countries

in an effort to boost its position on the world energy stage. It is aiming to seal a bilateral civil nuclear cooperation deal with Japan, a move that would open the way for cooperation between Rosatom and Toshiba Corp., and has also sanctioned a potential strategic partnership between Germany's Siemens and Russia's Rosatom.

Siemens and Rosatom announced in early February that they have started discussions over a possible partnership in the nuclear energy field. The move follows Siemens' January announcement that it is pulling out of its nuclear partnership with Areva of France in order to pursue its own strategy in the industry.

Siemens has worked with Rosatom, Russia's state-owned nuclear giant, on a number of previous occasions and a fully-fledged partnership could lead to joint ventures with Rosatom subsidiaries Atomenergoprom and Atomstroyexport. The two companies have set up a working group to examine possible arrangements, and Siemens CEO Peter Löscher has indicated that a deal could be reached by the end of April.

"We're pleased to be invited to discussions on expanding our existing



Abdullah Gul: discussing energy possibilities with Russia

cooperation in energy technology to include nuclear power," said Löscher. "We've been doing business in Russia for more than 150 years and have built up outstanding and successful partnerships here which we would like to further intensify."

Siemens and Rosatom have worked together at the Bohunice and Mochovce power plants in Slovakia, where Siemens provided the safety and operational instrumentation and control equipment. The two companies are currently partnering with Atomstroyexport on the Belene

nuclear power plant project in Bulgaria.

Atomenergoprom is Russia's newly created civil nuclear corporation, with capabilities across the whole nuclear cycle from uranium production to nuclear plant construction and operation. It is one of the world's largest civil nuclear reactor operators and claims a 40 per cent share in the world market for uranium enrichment services.

Atomstroyexport is responsible for the export of Russian nuclear technology.

Jordan inks nuclear deal with Canada

Canada is planning to support Jordan in its quest to implement a nuclear power programme through a new cooperation agreement signed by the two countries.

The cooperation agreement on the peaceful use of nuclear energy follows a memorandum of understanding signed in June 2008 by the Jordan Atomic Energy Commission (JAEC), Atomic Energy of Canada Limited (AECL) and SNC-Lavalin International. Jordan has also signed similar deals with France, China, the UK and the Republic of Korea.

Under the agreement, Canada will assist Jordan in the construction of a nuclear power plant and will also support the country in the areas of nuclear safety and radiological emergency plans. Training of personnel and the exploitation of uranium resources in Jordan are also covered in the agreement.

Jordan is planning to implement a nuclear power programme in order to meet rising electricity demand and reduce dependence on energy imports. It plans to have its first reactor operational by 2016.

Jordan currently imports around 96 per cent of its energy needs.

Time is running out, warn climate scientists

- Carbon emissions rising
- Gore: switch away from fossil fuels

A leading scientist has said that the use of coal as an energy resource all over the world is largely responsible for an increase in emissions of greenhouse gases since the 1990s.

Professor Christopher Field of the Carnegie Institution for Science told a recent meeting of the American Association for the Advancement of Science (AAAS) that emissions of greenhouse gases such as carbon dioxide are growing faster than ever before and will continue to do so if countries maintain their focus on the cheapest sources of energy.

His views on greenhouse gas emissions were echoed by a number of other leading scientists, who warned that the impacts of global warming would be worse than previously thought.

Prof. Field said at the Chicago meeting that carbon emissions have been growing at 3.5 per cent per year since 2000, up from 0.9 per cent per year in the 1990s. Past projections for declines in emissions were too optimistic, with no part of the world experiencing a decline in emissions from 2000 to 2008, he added.

Anny Cazenave of France's National Center for Space Studies told the conference that improved satellite measurements show that sea levels are rising faster than had been expected. Other potential impacts are ocean acidification, spreading deserts, dry aquifers and degraded soils.

Planetary scientist Susan W. Kieffer called for an international organization to coordinate responses to the threats of climate change, and also noted that the

human species is consuming resources that took millions of years to form in "shallow time".

Former US vice president Al Gore also addressed the meeting and called on scientists to communicate the urgency of climate change to political leaders and the public. He also stressed the need for a switch away from fossil fuels.

"The answer... is this generational, one-off investment to switch from an energy infrastructure that's based on expensive, dirty, and vulnerable fuels, based on carbon, and switch instead to an infrastructure based on fuels that are free, from the sun and the wind and geothermal sources, efficiency and science, innovation and ingenuity," said Gore.

Bushehr starts pilot operation

Iran's controversial nuclear programme was set to mark a major landmark in February with the start of a pilot operation phase at the Bushehr nuclear power plant.

The country's Foreign Ministry said that it would launch the programme on February 24, bringing its first nuclear power plant one step closer to commercial operation. The Russian firm that is building the plant says that it is on schedule to complete the project in 2009.

Iran is planning to mark the occasion with a ceremony attended by senior Russian officials and representatives from Russian nuclear energy firm Rosatom, according to local reports. Development of the project has been repeatedly delayed, largely due to financial problems, says Moscow.

Under a contract signed between Moscow and Tehran, Rosatom and its subsidiaries agreed to finish the 1000 MW VVER facility by the end of 2006. Construction of the plant started in 1975 but was abandoned during the Iranian Revolution.

Russia completed delivery of nuclear fuel to the plant in 2008.

Utility fortunes is a mixed bag

- EDF, Vattenfall report falls
- Iberdrola sees promise in renewables

The global financial crisis is taking its toll on the European utility sector, with many key market players presenting disappointing results for 2008.

French giant EDF has announced a new asset sale programme alongside a sharp drop in profits resulting largely from reduced industrial energy consumption. Spanish firm Iberdrola and Sweden's Vattenfall also disappointed.

EDF says that it will put €5 billion in assets up for sale to help reduce historically high levels of debt. The firm's profits have also been hit by the French government's decision to extend preferential industrial tariffs to 2010, and two major recent

acquisitions: British Energy (€13.5 billion) and the \$4.5 billion purchase of a 50 per cent stake in the nuclear power assets of Constellation Energy of the USA.

Net income at the firm fell in 2008 by 7.9 per cent to €4.3 billion. Analysts have indicated that domestic industrial consumption in France has dropped by up to 15 per cent in the last year.

Another French firm, GDF Suez, has reported a strong rise in sales figures for 2008, with revenues rising by 16.6 per cent to €83.1 billion. The main drivers for the performance include its continued investment in infrastructure and its business plan for the European and international gas and electricity

sectors, says the company.

While Iberdrola's full-year results saw a 22 per cent rise in net profits, its fourth quarter net profits fell by 49 per cent due to a fall in power generation. The company is to cut its 2009 capital expenditure programme to €4.2 billion from €7.5 billion in 2008.

Iberdrola does see a silver lining in its renewable energy subsidiary, Iberdrola Renovables, whose fourth quarter net profits more than doubled year-on-year to €159.4 million. Earnings before interests, taxes, depreciation and amortization, or Ebitda, rose to €417.5 million, from €206 million in the fourth quarter 2007.



Generating profits? Europe's utilities report mixed results

The company's strong results were helped by a rise in electricity prices as well as the addition of new generating capacity. Iberdrola Renovables is set to invest €2 billion in 2009, down from €3.8 billion in 2008.

While the financial crisis has cast doubt over the ability of renewable energy firms to secure financing for projects, Iberdrola says that it expects to add around 2 GW of new renewable energy capacity in 2009. It is particularly positive about the US market due to the passage of the federal stimulus package, and also the European market due to the presence of ambitious renewable energy targets.

Another firm reporting strong results last month was Italy's Enel, which reported revenues of €61 billion for 2008, a 40 per cent increase compared to €43.7 billion for 2007. Its earnings before interest, taxes, depreciation and amortization were €14.2 billion for 2008, a 45 per cent increase over 2007.

Fulvio Conti, CEO of Enel, said: "The excellent results in 2008 confirm the soundness of our strategy that has made the group one of the world's main energy operators. Our debt has been reduced to €50 billion, in line with the goal set previously and down nearly €6 billion from the previous year.

GE, MHI share the load

GE and Mitsubishi Heavy Industries (MHI) say they are making a key step in meeting the need for better power plant efficiency and performance with plans to develop an advanced steam turbine.

The two companies have signed a memorandum of understanding to develop a "next generation" steam turbine for use in gas turbine combined cycle power plants. The move could result in a similar agreement for the development of a steam turbine for nuclear power applications, says GE.

Development of a new, advanced steam turbine product is viewed by both GE and MHI as an important step in their product evolution, and is being driven by customer requirements for greater efficiencies in combined cycle plants. Both companies would offer the final product as part of their respective equipment portfolios.

"This MOU with MHI will lead to a high performance steam turbine that will be able to meet the future customer performance and efficiency requirements of the growing combined cycle industry," said Steve Bolze, president of GE Energy's Power & Water business.

The creation of a partnership will help to speed up development of the new product. "Given the 100-year maturity of steam turbine technology, incremental performance enhancements require significant new technology investments," said Bolze. "By sharing in the development, GE and MHI will look to share best practices and development activities to bring a next generation combined cycle steam turbine product to market faster than either party could individually achieve."

Vattenfall bags Nuon



Lars G. Josefsson: the Nuon deal makes perfect sense

Swedish utility Vattenfall says that the acquisition of Dutch utility Nuon will boost its ambition to be climate-neutral by 2050.

Vattenfall has agreed an all-cash offer of €8.5 billion for 100 per cent of the shares in Nuon, which serves over three million customers in the Netherlands, Belgium and Germany. The deal will make Vattenfall the leading offshore wind energy company in Europe.

The move by Vattenfall follows a deal struck in January by German utility RWE to buy Nuon's main rival Essent. Nuon will become Vattenfall's third main business group, responsible for driving growth in the Benelux region and taking a leading role in the development of gas activities.

"Together, Vattenfall and Nuon have the scale to continue securing reliable,

affordable and clean energy," said Nuon CEO Øystein Løseth. "Our partnership will boost Nuon's investment programme for new, cleaner production and innovative energy technologies for our customers."

An important element of the partnership will be the combination of each firm's expertise in clean energy technologies, including carbon capture and storage (CCS) and renewables. They are likely to prioritise offshore wind programmes and the development of CCS projects such as the installations at Schwarze Pumpe in Germany and Buggenum in the Netherlands.

"I'm very pleased that we can take this important step," said Vattenfall CEO Lars G. Josefsson. "Nuon's widely respected knowledge in renewables and clean energy

- Clean energy expertise a clear driver
- Vattenfall to gain 3 million customers

technologies is a very valuable addition to our own. It will accelerate the realisation of Vattenfall's strategy to make electricity clean."

The backing of Vattenfall will give Nuon the financial strength to compete in Europe, while a greater foothold in Europe will enable the Swedish utility to further implement its strategy "towards a leading position in the European energy market and enhance our position in gas".

"All in all, this deal makes perfect sense," added Josefsson.

The transaction is subject to the approval of at least 80 per cent of Nuon shareholders and clearance from Europe's competition authorities. Vattenfall will initially purchase 49 per cent of Nuon shares, with the remaining 51 per cent to be purchased over the next six years.

Grid firm assesses storage

The operator of the UK's high voltage transmission grid is to investigate the potential value of energy storage systems through an agreement with Beacon Power Corporation.

National Grid has signed an information sharing and performance evaluation agreement with Beacon, a developer of flywheel energy storage systems.

The two-year agreement will enable National Grid to assess technical, performance and economic data associated with Beacon's flywheel systems as well as assess the future need for storage capacity on its grid. The UK firm is one of the largest investor-owned utility companies in the world with a presence in the US as well as the UK.

"National Grid is committed to assessing new energy technologies and their capacity to help create a more efficient, environmentally responsible and cost-effective modern grid," said Stan Blazewicz, Vice President, Global Head of Technology for National Grid. "The positive attributes of flywheel energy storage – especially its high efficiency, zero carbon emissions, and extremely fast response – make it a technology of significant interest and one we are keen to investigate."

Flywheel energy storage systems can be used for fast-response frequency regulation as well as for wind energy-related ramp mitigation, i.e. to compensate for fluctuating input to the grid from wind farms.

The output of wind farms is intermittent and other generators on the grid are required to compensate accordingly. Energy storage systems such as flywheels can help transmission firms such as National Grid to manage these assets more effectively.

Tenders, Bids & Contracts

Americas

Hydro-Québec to extend Gentilly-2 life

Canadian utility Hydro-Québec has awarded GE Energy a major contract to perform a turbine island refurbishment at the Gentilly-2 nuclear power station, extending the plant's life to 2040.

Under contracts valued at more than US\$120 million, GE Energy will replace and enhance key steam turbine and generator components, as well as repair and align the turbine generator foundation and install a new control system.

The 675 MW nuclear plant is a major supplier of electricity to Montreal and Québec City and is also a key contributor to the stability of Hydro-Québec's power grid.

The engineering and procurement phase of the refurbishment project is underway, with the construction work to start in 2011. The plant is expected to return to commercial service in 2012. Located in Bécancour on the banks of the St. Lawrence River, Gentilly-2 provides approximately three per cent of all power for the province of Quebec.

Wärtsilä receives first Uruguay order

Uruguayan utility UTE has awarded Wärtsilä a €5 million order to supply equipment and engineering for a new 80 MW baseload power plant in the country. The order represents Wärtsilä's first power plant installation in the country, where 70 per cent of electricity supplies are met by hydropower plants.

The new plant will be located within the existing Central Battle power plant field in Montevideo and will be based on eight previously used Wärtsilä 12V46 engines. Wärtsilä has also been awarded a two-year operation and maintenance (O&M) contract, with an option for a further two-year extension.

The new power plant is expected to be fully operational by the end of October 2009. The engines will initially run on heavy fuel oil (HFO), but will later be converted to gas and HFO dual-fuel capability, and will run mainly on gas.

Odebrecht to build Honduras dams

Brazilian construction firm Odebrecht has won a contract to build two hydroelectric dams in Honduras. The two projects will add a total of 210 MW of capacity to the grid and will cost around \$600 million.

The Los Llanitos and Jicatuyo dams will be located on the Ulua River in Santa Barbara province and their construction will be financed by the Central American Bank for Economic Integration, the Inter-American Development Bank, the World Bank, Brazil's state-owned BNDES development bank and Honduran state electric company ENEE.

Construction is set to begin in 2009 and will be complete in 2014.

Asia Pacific

Bangladesh plans 300 MW plant

The government of Bangladesh has invited bids from companies interested in building a new 300 MW power plant near Dhaka.

The new plant – located at Siddhiraganj – will be developed on a turnkey basis and will help the country to meet rising electricity demand. The project is being supported by the International Development Association (IDA), a

branch of the World Bank, which is providing it with a \$350 million credit.

The international tender for the project is being managed by the state-owned Electricity Generation Company of Bangladesh (EGCB), which expects construction work to start in late 2009. The submission deadline is 23 March, 2009.

EGCB has specified that the plant be a gas turbine-based peaking plant with a maximum output of 330 MW.

Two groups vie for Naga

Two Filipino-owned companies are continuing to show interest in the sale of the 55 MW Naga gas turbine power plant in the Philippines, according to the country's Power Sector Assets and Liabilities Management Corp (PSALM).

The state-run power sector privatization unit says that the two companies submitted the preparatory requirements for the sale of the plant, which is located in Cebu province, and have also participated in a recent pre-bid conference.

The pre-bid conference allows prospective bidders to clarify issues and concerns surrounding the sale, and to discuss the bidding procedures. Located at the Cebu I power plant complex in Naga, the plant is scheduled for bidding on April 22, 2009.

The Naga plant is currently owned by the National Power Corporation (Napocor) but is operated by SPC Power Corporation. PSALM is charged with the privatization of the country's power plants as a precursor to further liberalization of the power sector.

The privatization programme recently suffered a setback when the winning bidder in the sale of the 600 MW Calaca coal-fired power plant pulled out of the privatization.

Indonesia prepares for geothermal development

The Indonesian Energy and Mineral Resources Ministry is planning to invite bids for the development of 15 geothermal fields in the country.

The proposed projects will require a total investment of about \$4.5 billion and could generate up to 1500 MW of electricity, according to the ministry. The 15 fields are located in areas such as Aceh, East Java and West Nusatenggara and are among a total of 20 to be offered to investors this year.

GE wins coal mine methane project

Two of GE Energy's Jenbacher gas engines are to be installed at a site in China as part of a project aimed at reducing the country's greenhouse gas emissions.

The Sichuan Coal Group has selected the two engines for installation at its Furong project, which will use coal mine gas to generate power for an active mine. The units are scheduled to be in operation by the end of March 2009.

The Sichuan Coal Group Furong CMG Utilization Company power plant will feature two of GE Energy's gas engines, each providing an electrical output of 3,048 MW. The plant also will use the gas engines' exhaust gas to produce steam, which will be used in a steam turbine to generate additional power for the site.

The project will help the mine operator to comply with legislation imposed in 2008 that prohibits coal mines from releasing gases containing more than 30 per cent methane. The project will generate carbon credits under the UN's Clean Development Mechanism.

Emerson updates Chinese plant

Emerson Process Management says it has completed a project to update the control system at the Huaneng Dandong power plant in China.

The US-based firm has deployed its PlantWeb digital plant architecture and Smart Wireless technologies at Unit 1 of the plant, which is located near the city of Dandong in Liaoning Province. The upgrade has enhanced unit-wide compatibility, contributed to improved unit stability, responsiveness and thermal efficiencies, brought tighter overall control of plant operations as well as a more streamlined view of key plant and turbine parameters.

The project was carried out during a 50-day outage in late 2008 and involved the migration of its previous-generation WDPF control system to the Ovation expert control system.

MHI wins Indonesian GTCC order

Japan's Mitsubishi Heavy Industries (MHI) has won a major order to build a 750 MW combined cycle power plant in Indonesia.

The order was placed by Indonesia's state-owned power company PT PLN (Persero) and will involve construction of the new plant on a turnkey basis at a site located 10 km northeast of central Jakarta. The plant is slated to go on-line in November 2011 and will help the country to meet rapidly rising electricity demand growth.

Under the contract, MHI will supply two M701F gas turbines, two heat recovery steam generators (HRSGs), one steam turbine and the balance of plant (BOP) equipment. Mitsubishi Electric Corporation will supply the generators, while Areva T&D will provide the substations and power transmission facilities.

Electricity demand in Indonesia has been increasing sharply along with economic growth, and as a result West Java suffers from chronic power shortages. In order to ease the tight power supply situation PLN has been focusing on new power plant construction projects as well as expansion and repowering of existing facilities.

Europe

REpower secures major offshore wind order

REpower Systems AG has secured one of the largest contracts in the history of the wind industry by signing a framework agreement with RWE Innogy for the supply of 250 offshore wind turbines.

The agreement will be worth up to € billion to REpower and is the largest ever contract in the offshore wind energy sector.

The 5M and 6M wind turbines are scheduled for delivery between 2011 and 2015 and will be installed at projects around the coasts of the UK, the Netherlands and Germany. Many of the units will be installed at the planned Innogy 1 Nordsee windfarm located 40 km off the coast of the East Frisian island of Juist.

International

ABB wins SEC contract

ABB is to upgrade 15 substations in Saudi Arabia after it won an order worth \$63 million from the Saudi Electricity Company (SEC).

The substations covered by the contract are located in the country's eastern and central provinces and cover a range of voltage levels from 13.8 kV to 230 kV. The upgrade will help SEC, Saudi Arabia's national power transmission company, to distribute more power to help meet growing

demand from the industrial and residential sectors.

The project will be completed in 2011, with ABB providing a turnkey solution including the design, engineering, supply, installation, testing and commissioning of the equipment. The products to be used will include power transformers, medium voltage switchgear, protection and control equipment, as well as SCADA (supervisory control and data acquisition) solutions to enable better power monitoring and control.

Wärtsilä cements Nigeria contract

Finland's Wärtsilä has secured a contract from Lafarge Cement WAPCO Nigeria to supply a 100 MW power plant in Ewekoro, 70 km from the Nigerian capital of Lagos.

The new plant will comprise six Wärtsilä 18V50DF engines that can operate on either heavy fuel oil (HFO), light fuel oil (LFO) or gas. The turnkey project will supply electricity to Lafarge WAPCO's existing cement works, as well as to a new cement plant that is currently under construction.

The plant will give the cement facilities a reliable supply of electricity independent of the grid. Joost Bos, business development manager of Wärtsilä power plants in Nigeria, said: "The multi-fuel capability of the Wärtsilä 50DF engines is proving to be of increasing importance, especially in West Africa."

"Industrial customers ask for solutions that overcome challenges of power supply problems and possible disruptions in the gas supply."

SEC selects GE to add 2 GW at Riyadh

GE Energy has signed a contract worth nearly \$1 billion to supply over 30 gas turbines to Saudi Electricity Company's (SEC's) Riyadh Power Plant 10 (PP10) project. The project will add 2000 MW of capacity to the grid, helping to address energy shortages in the summer months.

The PP10 project will increase the power capacity in SEC's Central Operating Area by 20 per cent and is the latest expansion project at the Riyadh site, which has a total power output of 10 000 MW. GE will supply over 30 Frame 7EA gas turbines to the project via an EPC contractor.

The gas turbines at PP10 will use Arabian crude as the primary fuel and distillate for start-up and back-up operation. The first units will enter service in the first half of 2010, with the rest following in 2011.

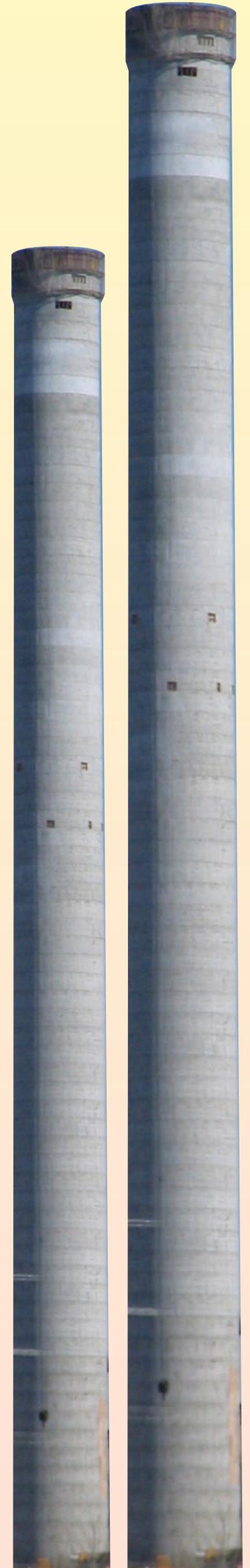
ABB will give Eskom flexibility

South African power utility Eskom has awarded ABB a \$53 million contract to strengthen the transmission network in the Western Cape region.

ABB will design, manufacture, install and commission six 765 kV capacitor banks at Alpha, Beta, Mercury and Perseus substations. The project is part of an initiative to increase power capacity in Cape Town and the surrounding areas and to give Eskom more flexibility.

The capacitors to be supplied under the contract will be based on ABB's Flexible Alternating Current Transmission Systems (FACTS) technology. The company will also supply its Mach2 advanced control and protection system, which will allow fast, flexible and real-time control.

FACTS technologies allow more power to be delivered more efficiently using the existing infrastructure.



Setting the basis for an optimized power system

China is continuing the rapid ramp-up of its power generating capacity while adjusting its energy mix to see greater use of renewables. In order to optimize the use of its energy resources and improve the overall structure of its power system, the country is developing a power grid that is now a world leader in terms of high voltage transmission technology.

Liu Zhenya

The last 10 years has been an important period for China's power sector. Tremendous growth has been achieved. The country's total installed capacity increased by 11 per cent annually from 277 GW in 1998 to 793 GW in 2008 while the total electricity consumption increased by 11.5 per cent annually from 1160 TWh to 3430 TWh.

This growth has also called for an expansion of China's national transmission system. The total installed length of transmission lines rated at over 35 kV increased by 6.1 per cent annually from 657 000 km to 1 183 000 km. At the same time, the total electrical energy transformation capacity increased by 13.4 per cent annually from 683 000 MVA to 2 408 000 MVA.

In the near future, the rapid growth of the power sector will certainly maintain its momentum. The construction and development of an ultra high voltage (UHV) power grid will be key to promoting the extensive development of large hydropower, thermal, nuclear power and renewable energy, as well as optimizing the allocation of energy resources on a wider scale.

It is estimated that China's total installed generating capacity will reach about 1600 GW in 2020. At the same time as growing the installed generating base, the current energy mix of thermal, hydro, nuclear and wind power will be further optimized. Thermal will decrease from the current 75.9 per cent to 66.3 per cent; hydro will increase slightly from 21.6 per cent to 23 per cent; nuclear power will increase from 1.1 per cent to 3 per cent and windpower will increase almost six-fold from 1.1 per cent to 6 per cent.

The rapid development of renewables, and in particular wind power, in recent years is notable. In 2008, the total installed capacity of wind turbines reached 9 GW, 11.7 times the level of 2004. The forecasted installed capacity will reach about 20 GW in 2010 and 100 GW in 2020. As for solar power, China has been developing integrated photovoltaic and demonstration projects, household photovoltaic power generation systems (small solar power plant) and photovoltaic power generation equipment for urban buildings and public facilities according to local conditions.

The development of the grid is crucial for the increased use of wind and solar. Basically, China's inland wind resources are mainly located in the north, northwest and northeast region of the country. The solar power resources with massive tapping potential are also concentrated in the western region. However, power demands in those areas are comparatively low and output from wind and solar power generation is highly variable.

Therefore, there is an urgent need to develop UHV power transmission lines and technology to allow the integration of these variable power sources to the grid. Currently, State Grid Corporation of China (SGCC) is working on power storage and wind/solar power connection technology to meet the challenges.

By 2020, China's total power demand and the total installed capacity will double from today's level. Energy

resources and industrial productivity in China are unevenly distributed, with 76 per cent of the nation's coal reserves in the north and 80 per cent of hydropower resources in the west. However, more than two thirds of the power demand is in central and eastern China. This means that the allocation of energy resources urgently needs to be optimized on a large scale across the country.

In order to support China's socio-economic development, SGCC proactively promotes and implements the strategy of 'One Ultra and Four Large', i.e. constructing a UHV power grid (including 1000 kV AC and ± 800 kV DC) and promoting the development of large thermal, hydro, nuclear and renewable energy bases. The strategy will effectively enable SGCC to transmit power over its 'electric power highway network' with high capacity and low losses over long distance. Only by doing this can China fulfill its multiple goals of: establishing its large energy generation bases of thermal, hydro, nuclear and renewable; optimizing national energy resources and securing long term and stable energy supply for its socio-economic growth.

Compared to the US and Europe, China may have started late in relation to the development of its national grid. Nevertheless, having learned from the advanced experience and best practices of our counterparts in Europe and the US, China is now making rapid progress. With domestic innovation and independent research and development, China has gradually risen to world-class level with regards to power grid technology.

In terms of grid voltage levels, China leads the world with its 1000 kV transmission technology while the US has achieved 765 kV and western Europe typically operates its high voltage grid at 400 kV. Like European countries and the US, China is seeing its grid go from 'small to big' and from 'weak to strong'. After years of intensive development, China now has a strong nationwide power grid network system.

There is an urgent need to develop UHV power transmission lines and technology to allow the integration of these variable power sources to the grid

The start of commercial operation of a 1000 kV UHV AC demonstration project in January 2009 marked a significant milestone. China became the first country in the world to have a commercially operating UHV power transmission line, signifying that its power grid technology is at the forefront of transmission system development.

According to the national plan, by 2020 China will establish a UHV synchronized network with three regional power grids in East China, North China and Central-China, linking grid networks in the Northeastern China power grid, the Northwestern China power grid and the Southern China power grid via strong UHV DC transmission links.

By 2020, the total transmission capacity of China's UHV network system will reach about 300 GW, of which hydropower will account for a significant portion of 78 GW. All of these will play a greater role in



Liu Zhenya: SGCC is building an electric 'power highway'

optimizing China's national energy strategy and promoting energy conservation, emission reduction as well as the coordinated development of the regional economies in China.

According to the need for power grid development, SGCC will continue to develop and advocate technologies such as UHV power transmission technology, super large grid system analysis and control technology,

Flexible AC Transmission System (FACTS), power grid disaster prevention technology, wind and solar power generation connection technology, large capacity power storage technology, as well as Smart Grid technology.

By developing and applying these technologies, we are hoping to further improve the safety, reliability and efficiency of power grid operation in China. These technologies will not only provide strong support for China's grid construction but will also play an important role in the development of the world's power industry.

Mr Liu Zhenya is President of State Grid Corporation of China. Mr Liu graduated with a Master's degree in Electrical Engineering from Shandong University and is a professor-level senior engineer with a distinguished career in China's power industry. He has served as President of State Grid Corporation of China since October 2004.

Oil

OPEC considers next step in light of economic downturn

- Attempts to raise crude oil prices could prolong economic downturn
- Saudi production cuts could impact associated gas production

By David Gregory

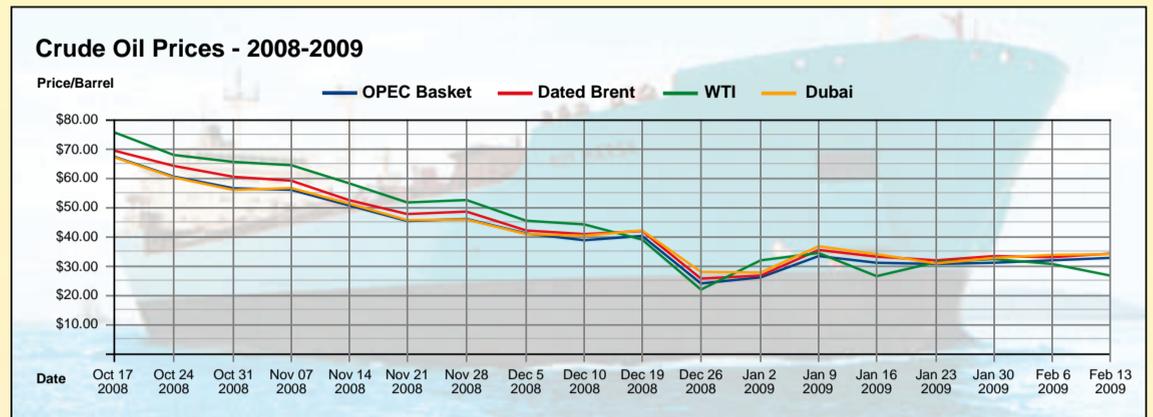
As the price of crude oil continues to struggle with demand destruction in the midst of a deepening recession, OPEC ministers will meet in Vienna on 15 March to assess the market and decide what – if anything – can be done to erase the glut and boost prices.

Despite OPEC's attempt to reduce production by 4.2 million b/d to a new output target of 24.845 million b/d as of January this year, crude oil prices in late February showed little sign that the group's production cuts were having an impact.

The situation has moved some OPEC members to suggest that further cuts should be endorsed at the next meeting, but analysts warn that attempts by OPEC to raise crude oil prices run the risk of prolonging the economic downturn.

In its latest *Monthly Oil Market Report (MOMR)*, published on 13 February, OPEC said "the sudden and massive erosion in demand has helped push crude oil inventories up sharply – in some key areas close to maximum capacity."

In one of its weekly status reports on the US oil industry shortly thereafter,



the US Energy Information Administration (EIA) released data showing that the WTI delivery point in Cushing, Oklahoma, had accumulated 34.9 million barrels, nearing its storage capacity. By late February, the growing stocks at Cushing had resulted in WTI being priced below \$40/b for weeks. At times the spread between it and ICE Brent rose to more than \$10/b. The OPEC Basket price also dipped below \$40/b in late February, creating more disappointment amongst OPEC members.

Speaking in Washington on 17 February, Algeria's Minister of Petroleum and Mines, Chakib Khelil, who also serves as OPEC President, said the group would be more likely to decide on further production cuts if crude oil prices fall below \$40/b.

But such a decision is also likely to depend on whether OPEC members have adhered to the cuts implied by the 24.845 million b/d target, and whether that level of production has succeeded in reducing crude stocks by mid-March.

Meanwhile, Nobuo Tanaka, the Executive Director of the Paris-based International Energy Agency (IEA), which represents the world's major crude oil consumers, has urged OPEC

not to make any further production cuts in an attempt to raise prices, saying that such an act could contradict attempts to encourage a global economic recovery.

OPEC's *MOMR* said its latest data shows that global demand for OPEC crude during 2008 averaged 30.9 million b/d, down by 400 000 b/d from 2007. The report forecast demand for OPEC crude during 2009 to average 29.2 million b/d, a decline of 1.7 million b/d from 2008.

World oil demand during 2008 averaged 85.70 million b/d, down by 190 000 b/d from 85.89 million b/d in 2007, according to the *MOMR*. For 2009, the report forecast that world demand in 2009 will average 85.13 million b/d, a further decline of 570 000 b/d.

"US oil demand is considered the major factor behind the vanishing growth in oil demand in 2008," the *MOMR* said. "North America alone shaved 1.2 million b/d from world oil demand last year. For the whole OECD region, the decline reached 1.6 million b/d."

Total OPEC production amounted to 28.71 million b/d during January 2009, down 959 000 b/d from December, according to the OPEC data, which

shows that OPEC members have made a concerted effort to remove excess supply from the market.

Saudi Arabia, OPEC's largest crude producer succeeded in reducing its crude output to 8.05 million b/d in January. Last summer its production went as high as 9.7 million b/d. The country is reported to have implemented a further cut of 300 000 b/d as of February.

However, Riyadh-based company Jadwa Investments recently suggested that the production cuts being made by Saudi Arabia could impact its associated gas production and reduce gas supplies to its domestic petrochemical industry as well as desalination and power generation facilities.

Eventually high crude oil prices are expected to return, but that scenario is envisaged as one of further strain on the industry when it will be struggling to complete capacity expansion projects now shelved for the lack of financing. Then, once again, high oil prices will focus investors' attention on alternative energies designed to beat the soaring price of crude.

But for now, OPEC is concerned with just how bad things could become as crude prices – and the global economy as a whole – continues to search for a floor.

Gas

Nord Stream gathers pace as Russia eyes expansion in Europe

With all necessary studies and agreements complete, the Nord Stream pipeline will be launched in 2011.

By Mark Goetz

Nord Stream AG, the Russian-German-Dutch joint venture building a pipeline designed to carry 55 billion m³ per year (bcm/y) of Russian natural gas to northern Europe via the Baltic Sea, announced in late February that its trans-boundary environmental

report will be ready for public participation in early March.

The company is required by a United Nations convention that requires projects such as Nord Stream to inform neighbouring countries about potential trans-boundary environmental impacts. Nord Stream said it would submit the report in the

nine languages of the Baltic Sea states this month.

Russia is keen to proceed with the project, which – like its proposed South Stream project across the Black Sea – it describes as an alternative route for gas deliveries to Europe because it bypasses former Soviet republics and countries that were once members of the Warsaw Pact, but which are now members of the European Union.

Alexei Miller, Chief Executive Officer of Gazprom, which is leading the €8 billion project, said last month that all necessary studies and agreements have been carried out and that the pipeline would be completed and launched in 2011.

Russian state-owned gas monopoly OAO Gazprom owns 51 per cent of Nord Stream AG, while Germany's BASF/Wintershall Holding and E.ON Ruhrgas AG each hold 20 per cent, and the Netherlands' N.V. Nederlandse Gasunie holds the remaining 9 per cent.

While Nord Stream will deliver natural gas to several EU states – supplies that Brussels acknowledges the EU will need as gas demand grows

– critics of the project describe it as an attempt by Moscow to undermine EU efforts to forge a common energy policy and a unified energy market. If the January crisis proved anything, it was that the EU needed a common policy and a unified market.

EU gas imports in 2005 amounted to 314 bcm and these are expected to grow by nearly 200 bcm to 509 bcm in 2025. Nord Stream is expected to supply about 25 per cent of the additional requirement. Furthermore, Gazprom expects to provide Europe with 35 per cent of the natural gas it consumes by 2020, compared with the 26 per cent it provides now.

Nord Stream will consist of two 1220 km pipelines running from Vyborg, Russia to Greifswald, Germany. Each pipeline will have a transport capacity of 27.5 bcm/y.

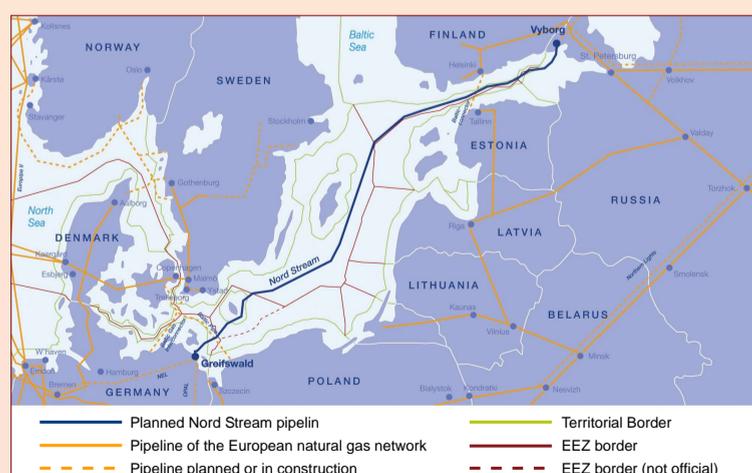
Why it has been necessary to build a gas pipeline to the EU that bypasses EU members has yet to be understood, although the company's position is that the pipeline will be more environmentally sound and operate more efficiently. Not only does the pipeline avoid an overland route, but it also avoids the offshore territories

of the Baltic States and Poland as much as possible.

The natural gas supply crisis that erupted between Russia and Ukraine in January suggests that the political animosity that exists between Moscow and Kiev is greater than the commitment by either nation to meet Europe's energy requirements.

The big chill of January led the EU to again voice its support for the proposed Nabucco gas pipeline, an €8 billion project designed to carry 31 bcm of Caspian and Middle East gas to Europe across Turkey and thus diminish European dependence on Russian supplies while avoiding Russian territory.

However, it is clear that the EU will rely on Russia for gas supplies indefinitely. Russian gas exports to Europe are expected to total 170 bcm during 2009, down from 179 bcm in 2008, the *Wall Street Journal* reported in early February. Citing figures produced by Gazprom, it said the Russian gas monopoly forecast an average price of \$280 per 1000 m³ for European customers during 2009, down from the 2008 average of \$409 per 1000 m³.



Nord Stream Pipeline Route

Crunch time for EU-ETS

The EU Emissions Trading Scheme – Europe's flagship policy instrument in the fight against climate change is struggling under the weight of collapsed industrial demand and bearish oil prices. Is it time to reconsider the current market-based approach?

Kash Burchett

Speculation in the context of markets normally refers to traders betting on the direction of prices but in the case of the EU-Emissions Trading Scheme (EU-ETS), it concerns the market's very existence. Despite freezing weather through the first two months of 2009, EU-ETS carbon prices have hit a two-year low. After a bullish 2008 in which trade in EU emission allowances (EUAs) increased some 83 per cent on the previous year, the global economic downturn has finally caught up with carbon markets. Following a high of over €30/t in early August last year, the price was hovering around € at the end of February.

The price of carbon has plunged for two essential reasons. Most potently, the need to pollute has simply diminished, as demand for power has shrunk with the recession. Total electricity consumption in Italy was down by almost 10 per cent in January compared with December 2008. Large French industrial clients cut their consumption by 18 per cent in December compared with the previous year, according to grid operator RTE. Germany's RWE predicts a 10 per cent decline in demand from MEUs this year. And in the UK, gas consumption has declined four per cent compared to last year, when exports and the low temperatures are factored out.

This contraction in industrial output means there are simply fewer players in the market demanding permits to emit carbon dioxide, resulting in a lower market price.

Secondly, the price of carbon credits roughly tracks the price of oil. As this has plummeted by around \$100 since August, comparatively clean gas has become more attractive relative to coal (which results in high levels of Green House Gas (GHG) emissions, thus demanding more permits). Hence the reduced difference between the profitability of coal and gas (the dark/spark spread) has softened demand for EUAs.

Accentuating this situation, cash-strapped firms have sought to boost their liquidity through selling their carbon credits. This has produced a glut in the market, driving the price of carbon down further.

The collapse in the price of EUAs has implications for international trading mechanisms. Certified Emission Reduction (CER) credits have essentially tracked the European Climate Exchange down, since they can be exchanged for

EUAs. Adding to this, capital finance available for clean energy assets in the developing world has contracted sharply, stymieing projects and thus further reducing demand for credits.

Moreover, a low carbon price produces an inaccurate representation of the external costs of fossil-fuel generation. In effect, the slump has reduced the incentive for utilities to desist from emitting GHGs and replace existing hydrocarbon-based assets with renewable sources.

These developments have prompted a rash of statements questioning the viability of market mechanisms in dealing with climate change. In late January, chief executive of EDF Energy Vincent de Rivaz whipped up a storm after being quoted in the UK's *Guardian* newspaper comparing the trade in carbon to the US sub-prime housing market. "We are at tipping point... and should consider whether we have the right balance in place between government policy, regulator responsibility and the market mechanism," he said. "We like certainty about the carbon price, but [it] has to become simple and not become a new type of sub-prime tool which will be diverted from its initial purpose: to encourage real investment in real low carbon technology."

There can be little doubt as to what "certainty" Mr de Rivaz was hinting at – the idea of a floor price for EUA credits is as old as the concept of a carbon market itself. Put simply, investors argue

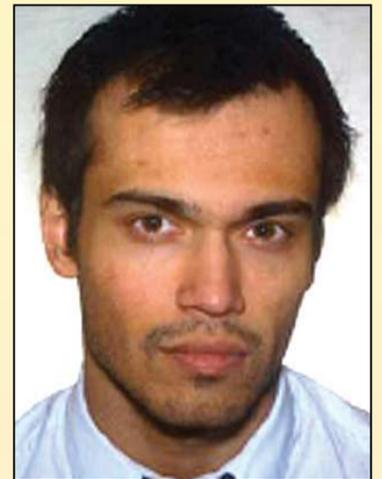
reserve price on the EUAs to be auctioned from 2013".

It is not just the bankers – who have a vested interest in the matter – who propose limits. Earlier in January, German economy minister Michael Glos called for a "price corridor" for EUAs after 2013, a proposal also promoted by Poland last year.

Currently, such interventionist policies do not appear likely to be implemented soon. Last month chief climate negotiator for the European Commission, Artur Runge-Metzger explicitly ruled out a price floor, saying "there is no way the Commission can intervene in the market to support prices or set any kind of floor price, that is something we leave to market forces, otherwise we will not have a market." His comments followed similar sentiments from Jos Delbeke – the chief architect behind the EU-ETS – who earlier publicly warned multilateral institutions against meddling with carbon prices.

Other governing bodies seem to agree. After several weeks of speculation that Australia might not implement its carbon pollution reduction scheme (CPRS) on account of the apparent failures in the European model, Canberra has reiterated its support for a purely trade-based approach. Under President Obama, America seems committed to the same course.

Yet western governments' taste for exclusively market-based solutions to climate change belies the facts. To date,



in the hands of central governments, since they effectively pick and choose the winners and losers. As an alternative, the Renewables Obligation sought to incentivise generators to switch to low-carbon alternatives by simply requiring utilities to source an increasing proportion of their overall generation capacity from renewable sources. It was argued that this would allow the utility to choose which source of renewable energy they would employ to meet their target quota: the market, rather than politically minded bureaucrats would determine which technologies and strategies would bring about the most cost effective results.

The fundamental difference between the two mechanisms is cost allocation. Whereas the RO seeks to increase renewable capacity whilst maintaining low consumer prices, the FiT bites the bullet and apportion the external costs of consumption to the end user. The distinction was perhaps best summed up by the UK's Department for Trade and Industry in describing its policy as "one of action but not of direct intervention".

In allocating costs, the FiT eliminates price uncertainty. Using Germany's experience as an example, in providing a stable investment climate the German government has enjoyed significantly greater success in boosting renewable capacity. So much so that London has belatedly decided to implement a moderate FiT alongside the RO.

Now consider this in the context of the EU-ETS: the mechanism can only deliver carbon-abatement technologies like carbon capture and storage when the cost of polluting is accurately factored into the total cost of generation, reflected in a high carbon price. The effective indexation of carbon markets to oil clearly does not deliver that necessary price level. Even if EUAs were to rise to such a threshold, utilities would continue gaming the system in that time, tipping GHG concentration levels over a precipice.

Paradoxically, markets require government intervention in order to create an institutional matrix which produces an outcome reflective of all costs; which incentivises renewable energy development. Brussels and indeed all governments need to realise that ensuring accurate representation of the external costs of consumption is an exercise in political economy as much as anything else. Mulish determination on the part of the EC to follow liberal economic principles to the letter overlooks the fundamental goal. Carbon markets will recover eventually but unfortunately, time is a commodity we cannot afford.

Kash Burchett is an energy and utilities analyst at Datamonitor.

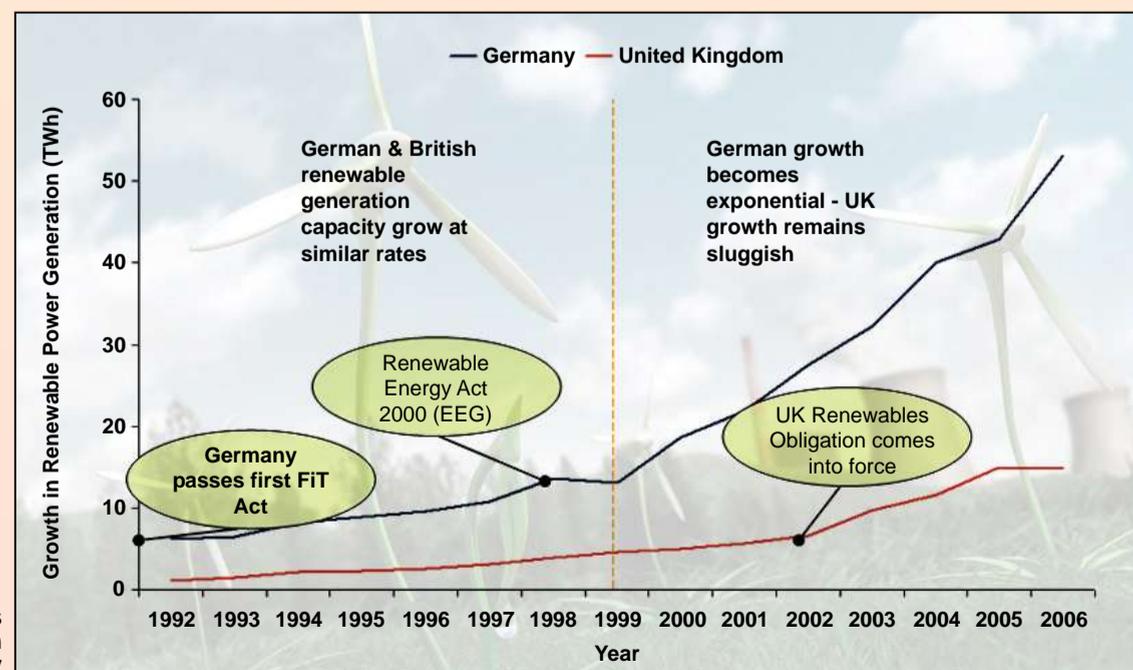
Mulish determination to follow liberal economic principles to the letter overlooks the fundamental goal

that if the necessary R&D work is to be carried out and infrastructure is to be installed, market players must have a clear price signal to justify parting with money.

Concurrently, some suggest the EU should put in place a minimum price – € has been mooted – in order to ensure that the market mechanism (supposedly providing a template for the rest of the world) does not collapse, particularly in light of the coming UN climate summit in Copenhagen this December. That is certainly the view of Deutsche Bank. In a recent report the investment bank argues: "If the EU authorities were to face severe and sustained EUA price weakness ahead of Copenhagen, they should ultimately be prepared to set a

no government has introduced a direct carbon tax to provide a counter-factual. As an alternative, we might compare feed-in tariffs (FiTs) popular in continental Europe with the Renewables Obligation in the United Kingdom. Both policies are intended to encourage utilities to shift their generation portfolios away from high emission assets and towards renewable sources of energy. The feed-in tariff operates by guaranteeing a long-term wholesale price for electricity from renewables. The government determines the level of the tariff to be paid for each renewable technology and sets the length of contract. The cost is effectively passed on to the consumer.

In 2002, the UK government argued that this approach placed too much power



The effect of differing policies on renewable power generation in the UK and Germany

Room to breathe

The rapidly rising level of renewable generating capacity in Europe is presenting utilities with new technical and economic challenges. The answer to their problems may lie in the development of an advanced form of large-scale energy storage, writes Siân Crampsie.

In late 2007, German utility RWE Power and US industrial giant GE announced plans to investigate the feasibility of developing an advanced, zero-emission energy storage technology known as AA-CAES (Advanced Adiabatic Compressed Air Energy Storage). A little over a year later, the two companies have completed an initial study into the technology, which they hope to be able to take forward to demonstration and then commercialization.

RWE and GE are not alone in expressing an interest in CAES systems, but are certainly unique in their focus on the advanced adiabatic form of the technology. A number of companies – including PSEG, Gaelectric and a group of Iowa-based utilities – are involved in various projects to develop and deploy CAES technology in the USA, but all of these are based on so-called second-generation CAES rather than the more complex AA-CAES.

There are currently only two existing CAES facilities in the world – a 30-year old plant at Huntorf, Germany, operated by E.ON and an 18-year old plant in Alabama, USA, operated by power supply cooperative PowerSouth. Both of these are providing valuable operating experience as well as demonstrating how CAES systems can help utilities to optimise the operation of their assets.

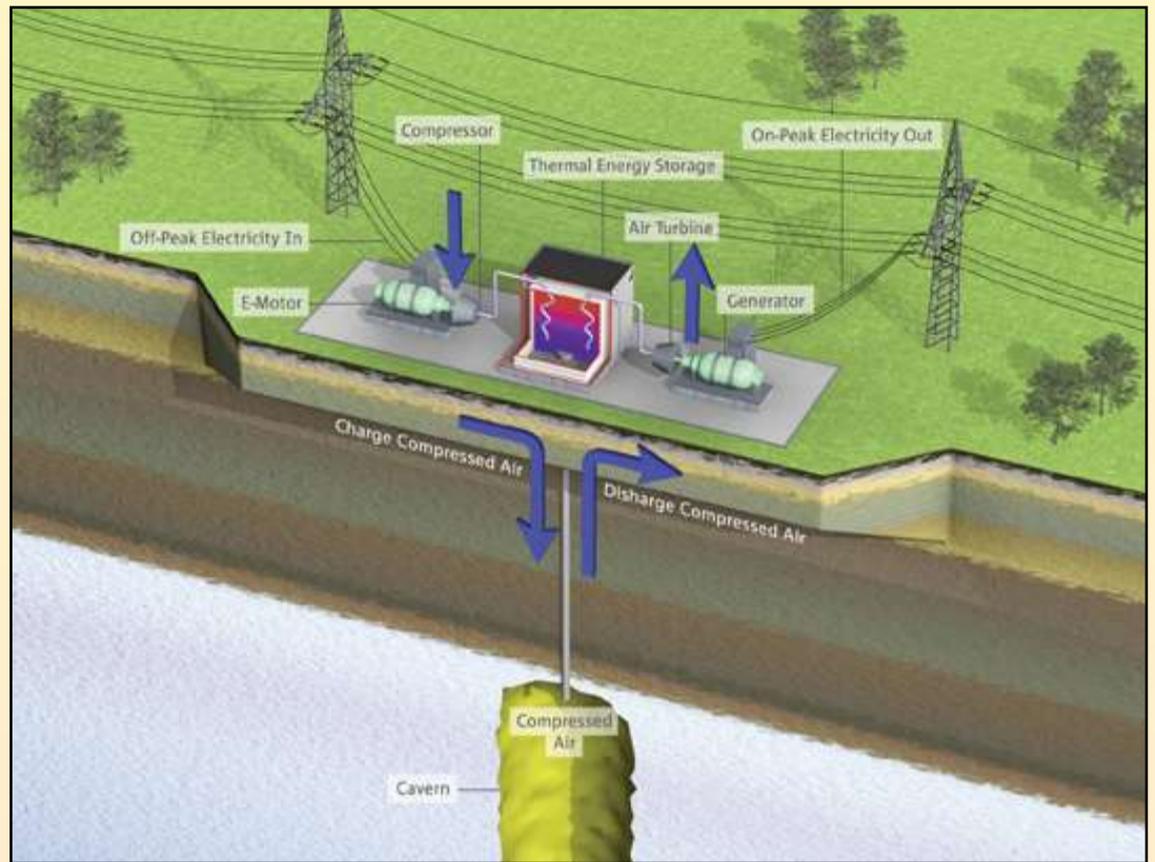
It is the ability of CAES plants to improve the balance between supply and demand in grids that has led to a revival of interest in the technology. And while second-generation systems are considered technically and even economically feasible, AA-CAES technology presents some considerable challenges.

GE and RWE have been addressing these challenges over the last few months in their joint feasibility study. They believe that if the challenges can be overcome, and if the market conditions are right, then the benefits that AA-CAES could bring will be worth the investment because the technology will help utilities to overcome new demands on the grid.

The rapidly rising levels of renewable energy capacity on the grid, particularly in Europe and North America is driving development of CAES and other energy storage systems. Renewable energy systems create problems for utilities because their use is not demand-driven, like conventional power plants, but is dependent on whether the wind is blowing or the sun is shining, for example. And as renewable energy systems start-up and shut off, conventional power plants must compensate accordingly.

Offshore wind development presents a particular challenge, especially in Europe, according to RWE. The European Wind Energy Association predicts that the EU-27 will have an installed capacity of offshore wind of 3.5 GW by 2010 and 120 GW by 2030, up from just over 1 GW in 2007.

In addition, the widespread use of large amounts of renewable energy will have an impact on the capacity factors of conventional power plants. This in turn will affect the economics of power plants using advanced technologies such as IGCC and supercritical steam conditions, which require high utilization rates in order for investors to gain a return on their



CAES systems work by compressing air and storing it underground in large geological formations. The air is compressed using motor-driven compressors when electricity demand is low. When demand is high, the compressed air is released, heated and expanded through a turbine to generate electricity

investment.

Energy storage on the grid will help smooth the output from renewable energy facilities and even overcome the transmission bottlenecks created by concentrations of renewable energy sources.

The benefit of CAES systems, which are large-scale compared to most other energy storage technologies, is that they allow all the power plants in a system to run at their optimal set point, thus minimising emissions from all sources.

There is a window of opportunity that must be exploited now if the technology is to be available in the next decade

CAES systems work by compressing air and storing it underground in large geological formations such as salt caverns. The air is compressed using motor-driven compressors when electricity demand is low, for example at night or at weekends. When electricity demand is high, the compressed air is released, heated and expanded through a turbine, generating electricity.

While such conventional CAES systems have the benefit of allowing utilities to arbitrage energy costs and perform peak shaving, the process could be made much more efficient, according to Roland Marquardt, R&D Engineer at RWE Power.

"In conventional systems, compression heat is rejected by inter-coolers and cool air is stored," explains Marquardt. "And to generate electricity, natural gas is needed to pre-heat the cold cavern air."

"Advanced adiabatic systems get around the heat rejection in the compression phase by using thermal energy storage. You compress the air with minimal inter-cooling and

transfer the heat from compression to an energy storage system. When the air is discharged, the stored heat is used for pre-heating and there is no need for natural gas."

The efficiency achieved by AA-CAES systems could reach 70 per cent, compared with 54 per cent for conventional CAES systems, according to Marquardt.

RWE and GE's initial investigations indicate that a recuperated heat storage system using ceramic bricks would be the best method of storing the heat of compression, although

are not really an issue."

GE Oil and Gas has been responsible for investigating the feasibility of using its turbomachinery in AA-CAES systems, while RWE has focused more on the thermal energy storage aspects of the technology. They believe that development of the air expansion turbine and salt cavern engineering will be straightforward, but the economics of the technology is more uncertain.

Because the only existing CAES facilities were built some time ago, RWE says that estimating the cost of constructing an AA-CAES facility is difficult. In addition, the results of the European study completed in 2006 indicate that an AA-CAES plant would not be economically feasible today.

However, RWE is heartened by the fact that the projected increase in renewable energy will result in an increase in electricity price volatility, and it is in this sort of environment that energy storage can thrive, economically speaking.

"The large expansion of offshore wind generation will make a good case for energy storage because it becomes economically feasible when the spread between peak and off-peak energy prices is large," says Marquardt. "The European study indicated that an AA-CAES plant could have operated economically in 2006, for example, because it was a hot summer and demand was high but the output of conventional plants dropped because of reduced water availability and the price spread went up."

RWE's aim is to start a development programme in 2009 and demonstrate the technology from 2012 onwards. Marquardt stresses that there is a window of opportunity that must be exploited now if the technology is to be available in the next decade.

Marquardt says that further development is required. However, the minimization of inter-cooling in the compression stage presents them with a major challenge.

"Temperature is the main challenge because the compressor outlet temperature will reach 620°C," says Marquardt, who also notes that a European Commission-funded study into AA-CAES carried out three years ago indicated that a completely new compressor design would be required.

"Our feasibility study investigated the possibility of developing a compressor and turbine using mainly standard components, and looked at what adjustments would be needed," says Marquardt. "A lot of options have been investigated and we have narrowed it down to two or three options that could be realised using GE equipment, but we will need more follow-up in the development phase."

"We are confident that technical solutions are available to overcome this challenge because in gas turbine technology temperatures of this kind



Junior Isles

Who says the lady is not for turning?

In 1980, UK prime minister Margaret Thatcher made a defiant speech to Conservatives at the party conference in Brighton. In it she stressed her determination to stick to tough economic policies despite doubts expressed within her own political party.

Responding to expectations of an about-turn on counter-inflationary policies, Mrs Thatcher declared: *"To those waiting with bated breath for that favourite media catchphrase, the U-turn, I have only one thing to say: You turn if you want to. The lady's not for turning!"*

For good or ill, the "Iron Lady" was consistent and unwavering but there are times when making a U-turn is perhaps the most pragmatic course of action.

Last month, both Italy and Sweden announced they would reverse decisions taken in the 1980s to ban nuclear power.

Italy's decision to end the 22-year hiatus is understandable. It has limited energy resources and wants to diversify supplies and ease its 80-85 per cent dependence on fuel imports. Its power prices are also among the highest in Europe. The government now wants to build between eight and 10 new-generation nuclear reactors and aims to start building the first one in 2013.

Carlo Bellini, professor of energy economics at Rome's Luiss university said he doubted whether first concrete would be poured for five years since the country had to first rebuild its nuclear safety authority and identify sites. Opponents say there are no suitable sites in Italy for building new power stations and storing nuclear waste.

Sweden held its referendum on nuclear in 1980, coincidentally the same year as Thatcher's famous U-turn speech, and subsequently decided to phase out its 10 nuclear plants. Although nearly half of its power comes from nuclear, Sweden's U-turn was in some respects more surprising than Italy's. The country has always been seen as 'green' due to abundant domestic and imported hydropower from Norway, which has also resulted in low power prices.

Yet it is perhaps a redefining of the word 'green' that has caused the

turnaround. The term once strictly referred to renewables. Now with all the publicity surrounding climate change, being green is becoming more synonymous with the phrase 'low carbon'.

Some clever marketers now even attempt to apply the term green to 'clean coal' technologies. Perhaps this is a leap too far. Nonetheless, the subtle change in definition has opened the door for nuclear.

The Swedish government feels that in order to meet its 2020 goal of cutting carbon emissions by 40 per cent from 1990 levels it will need nuclear power. The centre-right government wants the new reactors to be built to replace the country's 10 existing stations. Speaking at a press conference to unveil the new

and that delaying the process with time-consuming public inquiries and legal challenges would seriously undermine Britain's promise to cut its carbon emissions by 80 per cent by 2050.

The UK has lifted its self-imposed moratorium on the construction of the next generation of nuclear power stations and is actively seeking public support in the selection of the strategically important sites where they will be built by 2025.

The four leading environmentalists who are now lobbying in favour of nuclear power are Stephen Tindale, former director of Greenpeace; Chris Goodall, a Green Party activist and prospective parliamentary candidate; Lord Chris Smith of Finsbury, the chairman of the Environment

Italy's decision to end the 22-year hiatus is understandable. It has limited energy resources and wants to diversify supplies and ease its 80-85 per cent dependence on fuel imports

climate change plan, prime minister Fredrik Reinfeldt said that "the majority of the increasing electricity production in the coming years will come from renewable energy", but argued that nuclear power represented "an active way to decrease our dependence on fossil fuels".

The word green has been the cornerstone of every Green [political] party around the world. Yet this shift in terminology and strict focus on CO₂ reduction is now seeing some pretty high-profile U-turns in the energy arena.

Former opponents of nuclear power, who include the former head of Greenpeace, told UK newspaper *The Independent* that they have changed their stance on nuclear power because of the urgent need to curb carbon dioxide emissions.

It is the first time that senior environmental campaigners have publicly backed nuclear power and will be a welcome boost to the UK government, which could face strong protests against the new generation of nuclear power stations at the planning stage.

They now say that the building of nuclear power stations is imperative

Agency; and Mark Lynas, author of the Royal Society's science book of the year.

Mr Tindale, who ran Greenpeace for five years until he resigned in 2005, has taken a strong anti-nuclear stance throughout his career as an environmentalist. "My position was necessarily that nuclear power was wrong, partly for the pollution and nuclear waste reasons but primarily because of the risk of proliferation of nuclear weapons," Mr Tindale said.

"My change of mind wasn't sudden, but gradual over the past four years. But the key moment when I thought that we needed to be extremely serious was when it was reported that the permafrost in Siberia was melting massively, giving up methane, which is a very serious problem for the world," he said.

Meanwhile, Goodall said that he was now "reluctantly" supporting new nuclear power stations because of growing concerns about climate change. But perhaps it is not so much that Goodall is pro-nuclear but more that he sees nuclear as the lesser of two evils. Goodall, now facing calls to be deselected as Green candidate for the Oxford West and Abingdon

constituency, raised his concerns with the growing economic incentive to use coal fired power generation.

In his columns in *The Independent* he used Germany to provide a "useful cautionary tale". He said that despite huge subsidies for solar panels, photovoltaics have not yet replaced one per cent of fossil fuel electricity generation. "Indeed, because Germany – under pressure from well-meaning environmentalists – is phasing out nuclear power, it is inexorably turning back towards dirty coal: 30 new coal plants are planned, including four burning lignite (brown coal), the dirtiest fuel of all," he wrote.

Attempting to hold the ranks together, the leader of the Green Party in the UK, Caroline Lucas, responded: "There is no need for anyone to panic themselves into thinking nuclear power is a possible solution to climate change."

Ms Lucas, MEP for South East England, said: "Of course the government and the nuclear lobbyists will try to use fear of climate change to divide the Green movement and argue for nuclear power. But we must hold our nerve."

For some reason, nuclear is the one form of power generation that seems to generate an emotive response from many individuals. Certainly it is the only one where some governments have allowed public sentiment to decide its future.

Five years ago, the UK said no new nuclear plants would be built for the foreseeable future. Instead the focus would be on increasing the level of renewables. This statement still holds today, partially. However with slower progress than expected with renewables and climate change taking on a much more imminent threat, the 'foreseeable future' is now here.

The Green Party, like any individual able to look at the situation impartially, needs to move on and perhaps take heed from another extract of that same speech from Margaret Thatcher: *"... I prefer to believe that certain lessons have been learnt from experience, that we are coming, slowly, painfully, to an autumn of understanding. And I hope that it will be followed by a winter of common sense..."*

Honey, how on earth are we going to get there now?!

