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World's largest emitters seek cooperation

US Energy Secretary Steven Chu: encouraging cooperative research on energy efficiency and clean coal

Talks between US and Chinese officials highlight the need for cooperation as well as the obstacles that need to be overcome ahead of a Copenhagen agreement.

Junior Isles

Top officials from China and the US are discussing how to increase cooperation to ensure a positive outcome at the United Nations Framework Convention on Climate Change in Copenhagen in December.

Recent discussions between US president Barack Obama's top energy and climate change officials with China's senior negotiators in Washington highlighted a need for "practical action together" that "would need to be scaled up in order to meet the challenge of climate change."

In his 2010 budget, Obama targeted a reduction of 14 per cent of

greenhouse gas emissions from 2005 levels by 2020 and 83 per cent below 2005 levels by 2050.

China, meanwhile is concerned that such targets would cripple its growth as an industrializing nation, and is instead arguing for a more lenient approach as it develops. Although with 1.32 billion people and developing demand forcing the country to build a new coal-fired plant every week, China points to the fact that its carbon dioxide emissions per capita is around 20 per cent that of the US.

The US and China agree that an international accord should be based on a principle of "common but

differentiated responsibilities" that allows a less stringent and longer-term flexibility for developing countries.

China also pressed for the US Congress to pass legislation to fight global warming, warning that inaction could hold up a new treaty in Copenhagen.

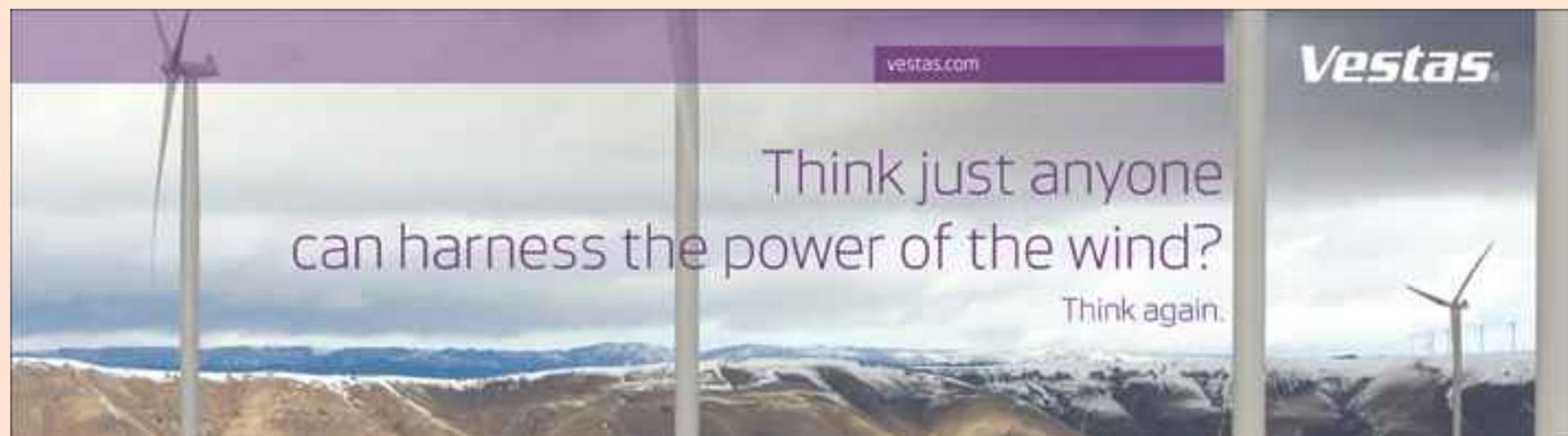
China's chief climate negotiator Xie Zhenhua said China was still waiting to see rich nations' commitments before putting its own ideas on the negotiating table. "The difficulty in reaching an accord is how can we reach the mid-term goals," he said. "Canada has not yet issued emission figures to meet its commitments. The United States is in the same boat –

there is just talk but no action. The key point is whether Congress will pass a bill."

Obama supports a cap-and-trade system that restricts emissions and allows trading of credits, thereby creating an economic incentive for companies to go green. But some lawmakers of the rival Republican Party equate it to a national sales tax and say it would hurt an economy already suffering an economic crisis.

Energy Secretary, Stephen Chu, warned that the US could slap duties on products from countries that do not curb carbon emissions, saying it would

Continued on page 2



(Continued from page 1)

level the playing field for US industry. Such a move, however, is likely to anger China and other emerging economies such as India.

Li Gao, the director of China's National Development and Reform Commission climate division and a senior negotiator for the government warned against countries establishing "carbon tariffs" on emission-intensive goods such as steel, warning it could spark a trade war and would be "a disaster". He said: "It does not abide by the rules [of the World Trade Organization] and secondly, it's not fair."

Discussions also covered financing and technology transfer issues, which developing countries say they need to help transition to low-carbon economies.

US officials agree that developed countries need to help to finance the technology transfer for low carbon energy and efficiency measures. Secretary Chu said he would be encouraging cooperative research on energy efficiency and clean coal technologies. "If we co-develop it, then we co-own it... and I can see how there's not a question of whose property it is," Chu told reporters on the sidelines of another event in Washington.

EU urges Japan and US to cut emissions

The European Union has urged Japan and the US to reduce their greenhouse gas emissions by 24 per cent by 2020 from 1990 levels in an attempt to ensure the comparability of efforts among developed countries in the fight against global warming.

"We are not demanding that Japan take on precisely 24 per cent. I don't imagine it's coming up with the same number, but we look for something reasonably close or even greater," said James Hunt, climate change envoy for Czech environment minister, Martin Bursik, whose country currently holds the rotating presidency of the 27-nation bloc.

The EU figure could influence debate on Japan's emissions reduction target for 2020, which prime minister Taro Aso says he will unveil by June prior to a Group of Eight summit in Italy in July and the UN climate change conference in Copenhagen in December.

Alluding to the EU-calculated target for Washington, Hunt indicated that US president Barack Obama's pledge to bring US emissions back to 1990 levels by 2020 will not be enough to address climate change.

The EU took into account four parameters – gross domestic product per capita, emissions per unit of GDP, countries' population trends between 1990 and 2005, and countries' past efforts to reduce emissions over the same period – when calculating targets for Japan and other advanced economies so as to ensure industrial nations as a group will achieve a 30 per cent reduction by 2020 from 1990 levels.

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US assesses potential for sequestration

As a number of US states begin experiments with carbon sequestration, a report has been issued that will help assess the potential of sites for storing CO₂ underground, writes **Junior Isles**

The US Geological Survey (USGS) has released a report that describes a methodology to assess the nation's potential for carbon sequestration – the injection of liquefied carbon dioxide into rocks below the earth's surface. The new methodology identifies a means to assess the volume of pore space in subsurface rocks that is able to store carbon dioxide for tens of thousand of years.

Secretary of the Interior Ken Salazar said: "The report will help us find the best places in the country for this type of carbon sequestration. The development of this assessment methodology marks a critical first step in our understanding of how much carbon dioxide can be stored in the subsurface."

The true global storage capacity of

carbon dioxide in geologic formations is unknown at this point, and this method allows for an assessment that can characterize the storage potential in two types of storage units (saline formations and oil and gas reservoirs) in a uniform manner across the US.

Meanwhile, the Office of Fossil Energy's National Energy Technology Laboratory (NETL) has created a comprehensive new document that examines existing and emerging techniques to monitor, verify, and account for CO₂ stored in geologic formations. The report, titled *Monitoring, Verification, and Accounting of CO₂ Stored in Deep Geologic Formations*, was prepared by NETL with input from the seven Regional Carbon Sequestration Partnerships.



Looking for the best spots: president Obama and Ken Salazar

The US Department of Energy says it will solicit applications for four different types of CO₂ storage projects, using the \$3.4 billion allocated in the recently signed economic recovery package to fund the advanced technologies.

Last month, researchers began injecting carbon dioxide underground in northwestern North Dakota to test how well the gas bonds with low-grade coal.

John Harju, an associate research director at the University of North Dakota's Energy and Environmental Research Centre (EERC) said it is the first time a lignite seam has been tested for carbon sequestration. He says the low-grade coal appears to "act like a sponge" in retaining CO₂. Another project is planned this month in

Williams County to inject CO₂ 2400 m underground into a depleted oil well.

Other states are also looking to test CO₂ sequestration. In late March, federal and state environmental regulators approved a plan to pump CO₂ into wells beneath the Cholla power plant outside Joseph City in eastern Arizona. The gas would be commercially purchased, and Arizona Public Service Co. has no immediate plans to equip its plant to capture CO₂.

Montana is also preparing itself for storing CO₂ underground. Republican senator Keith Bales, although sceptical about global warming recently commented: "I think it behoves us to have a system in place – and to work with the federal government to adopt regulations and rules to sequester carbon dioxide when and if that time arrives."

World warms to nuclear but waste doubts linger

■ Survey largely supports use of nuclear
■ Efficient waste disposal a top issue

More than two-thirds of people around the world believe that their countries should start using or increase their use of nuclear power, according to findings of a global survey released by Accenture. However, many countries are still grappling with what to do with radioactive waste.

The strongest support for nuclear energy as a means of reducing fossil fuel reliance came from respondents in India (67 per cent), China (62 per cent), the US (57 per cent) and South Africa (55 per cent). Support was far lower in France (37 per cent), Italy (37 per cent), Belgium (36 per cent), Germany (31 per cent) and Brazil (29 per cent).

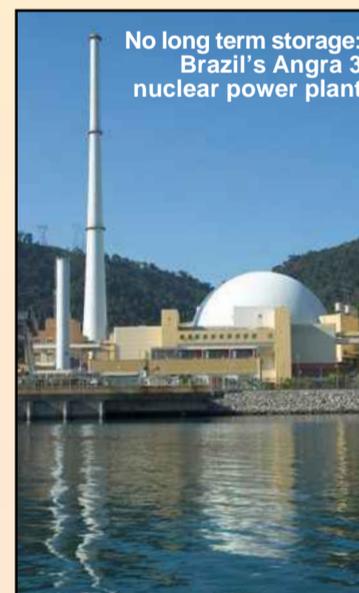
The survey of more than 10 000 people in 20 countries showed that 29 per cent of respondents support the use or increased use of nuclear power outright, and another 40 per cent say they would support nuclear power if their concerns were overcome. But in a warning to nuclear generators and policy makers, sentiment has polarized

in recent years.

"Concerns over energy security, volatile fossil-fuel prices and climate change have made nuclear energy more popular with consumers," said Sander van't Noordende, group chief executive of Accenture's Resources operating group. "But policy makers and generators should not assume that this makes consent easy to achieve or maintain. Government and the energy industry must take note of the continued fragility of popular support for nuclear power."

For respondents who oppose nuclear power generation in their countries, the top three factors for their opposition were concerns over: efficient waste disposal solutions; the safety of power plant operations; and decommissioning nuclear power plants.

Recent announcements in the US have not helped the controversy surrounding waste disposal. President Barack Obama's proposed budget all but killed the Yucca Mountain project, and means that spent fuel will for now



No long term storage: Brazil's Angra 3 nuclear power plant

remain next to more than 100 reactors in 35 states across the country.

Last month the Nuclear Regulator Commission (NRC) made a controversial announcement to regulate depleted uranium (DU) as Class-A low-level waste. Some say that the ruling means that states will be stuck with spent nuclear fuel for a long time.

Anti-nuclear groups have said DU is 40 times more radioactive than typical Class-A waste and is four times more hazardous than some types of plutonium. They say it needs to be secure for thousands of years – far longer than the 100-year hazard limit for Class-A waste.

Meanwhile Brazil has said that nuclear fuel waste from the Angra 3 nuclear power plant in Rio de Janeiro will not be stored in a long-term depository until 2026. Until then, it will be kept in storage pools that will be built near the plant, which is scheduled to come into operation in November 2014.

Calls to revive FutureGen amidst rising costs

The Gasification Technologies Council (GTC) have joined Republican politicians in urging the US Department of Energy to sign off on the FutureGen clean coal power plant proposed at Mattoon, Illinois.

"Using commercially proven technologies together for the first time in the plant would provide scale and certainty," said James Childress, executive director of the GTC. "It would demonstrate that we can generate electricity using coal while capturing and sequestering carbon dioxide, resulting in near-zero emissions."

In a recent letter to Energy Secretary, Stephen Chu, Reps. Tim Johnson, John Shimkus and Jerry Costello asked for \$1 billion of president Barack Obama's economic stimulus funds be used for the project.

However, the cost of the project seems to be escalating. Chu acknowledged that when the plant was cancelled, a faulty cost analysis put the price of the project higher than it should have been. However he said that even that \$1.8 billion figure might now be too low. Chu said that because of commodity costs and other factors, some estimates now put the price of the plant at \$2.3 billion.

He said: "A cost of more than \$2 billion is becoming a very deep issue with me because we need a portfolio of projects that can demonstrate carbon capture including those that FutureGen would not address, and there's just so much money to go around."



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US focuses on the long term

Enacting legislation on a national renewable energy standard and carbon trading are now priorities for the US government, writes Siân Crampsie.

The financial support offered to the US energy industry under the federal stimulus package is at risk of being wasted unless more long-term policies are quickly implemented, the industry has warned.

The American Wind Energy Association (AWEA) has joined over 220 groups in signing a letter to Congress that endorses a national renewable electricity standard (RES) as a way to provide the long-term policy commitment that businesses need to invest in clean energy.

Other major companies active in the renewable energy sector have also expressed concern that there has been little change in the level of activity in the industry since the ARRA stimulus bill was passed in February.

The new US administration has set ambitious targets for renewable energy and climate change and views investment in the energy sector as an important means of stimulating the economy out of recession. ARRA is designed to kick-start investment in areas such as renewable energy and transmission, but credit markets remain tight.

In their letter to Congress, AWEA and a total of 225 other signatories,

say that the adoption of a RES this year is important to the country's economic recovery. "A national renewable electricity standard is one of the most important steps we can take to encourage businesses to invest in clean energy and create thousands of new jobs right here in the US," said Denise Bode, CEO of AWEA. RES legislation has been introduced

"A national renewable electricity standard is one of the most important steps we can take."

to the US Congress that would require all states to generate at least 25 per cent of their electricity from renewable sources by 2025. The signatories of the letter to Congress note that a national RES would diversify sources of electricity generation, reduce energy bills and combat climate change.

The letter – signed by companies and groups such as AES, Babcock & Brown, First Wind, PSEG and Vestas – reads: "As our first long-term commitment to renewable energy, a national RES will provide stable policy support, spurring tens of billions of dollars in clean energy investment and



Denise Bode, CEO of AWEA is encouraging clean investments

creating hundreds of thousands of well-paying jobs."

President Obama's administration is currently working on legislation to reduce greenhouse gas emissions through a cap-and-trade system, and the President's first budget includes a raft of measures to further support development of renewable energy, carbon capture and storage (CCS) and

emissions trading system could result in higher costs for industry and consumers.

The proposed budget released by the White House in February projects revenues of \$15 billion/year from carbon permit auctioning, starting in 2012. It also aims to increase funding into clean coal and CCS technologies.

But in spite of Obama's positive views on clean coal and CCS technologies, several energy companies have decided to scrap plans for new coal-fired power plants, or at least delay making investment decisions until legislation surrounding carbon emissions has been passed.

In early March, Alliant Energy dropped plans for a new coal plant in Iowa, citing "increasing environmental, legislative and regulatory uncertainty regarding regulation of future greenhouse gas emissions" as part of the reason. In February, NV Energy announced it would delay the construction of a coal-fired power plant in Nevada until it can install CCS technology.

"While uncertainty exists, we basically are standing still," said NV Energy's Roberto Denis of federal regulation.

transmission system upgrades.

But the legislation on RES will take time to pass and enact and without it, the US renewable energy industry is likely to remain depressed for another year, the President of Siemens Energy, Randy Zwirn, was quoted as saying by *Dow Jones newswires*.

Similarly, uncertainty about carbon trading legislation continues to affect investments in new coal-fired power plants.

Democratic leaders in Congress are aiming to produce a climate change bill this year but the legislation is likely to be hotly debated as an

Oklahoma, Kentucky consider nuclear

Two US states are considering legislation that would allow the construction of nuclear power plants, a sign of the growing momentum of the nuclear renaissance in the country.

In Oklahoma, a bill that would allow nuclear power proposals to be considered by the state, cleared a legislative committee and is headed to the state House of Representatives. In Kentucky, a proposal to lift the state's longstanding ban on nuclear power plants is being considered.

Nuclear energy is increasingly being viewed by utilities as one of the best options for meeting future energy demand. The US Nuclear Regulatory Commission has so far received 17 applications to construct 26 new nuclear reactors.

Oklahoma's proposed Nuclear Power Incentives Act would establish a review process for the state Corporation Commission to consider nuclear power proposals and would create a task force to consider tax changes that would encourage construction of a nuclear power plant.

Progress on several new nuclear projects in the US has also been made in the last month, with Georgia Power winning approval from the state Public Service Commission to build two new reactors at Plant Vogtle, near Augusta. Meanwhile Toshiba has signed an EPC contract with the STP Nuclear Operating Company for two ABWR nuclear plants at the South Texas Project.

WB supports development initiative in Brazil

The Brazilian government has won financial support from the World Bank to improve the environmental performance of its economy and promote sustainable development.

The World Bank has approved a \$1.3 billion loan to Brazil to help the country integrate sustainability and environmental policies in the energy, forest management and water industries. Overcoming Brazil's rapidly rising energy demand is one of the key issues to be addressed by the programme.

The initiative will also integrate Brazil's climate change agenda across the sectors, and promote renewable energy. The country is attempting to unlock its economic potential through a growth acceleration programme but there are concerns that this will damage the country's rich environment.

Electricity demand in Brazil is forecast to grow at an average of 5.5 per cent per year up to 2017, according to the government's energy research body EPE. The renewable energy sector is recognised as having enormous potential and in recent years has attracted considerable interest from major energy groups such as GDF Suez and EDP.

FERC gears up for smart investment

- Guidance for industry proposed
- Smart grid will reduce emissions

Federal regulators in the US have indicated that utilities installing smart grid technologies will be able to recover their costs, a move that they hope will accelerate investment in the transmission system.

The Federal Energy Regulatory Commission (FERC) has released a proposed policy statement and action plan in a bid to bring greater certainty for utilities and savings for consumers. The policy is in line with President Obama's new energy policy and follows the announcement of funding for transmission projects in both the ARRA stimulus bill and the recent proposed federal budget.

According to FERC, investment in smart grid technologies would make the US power system operate more securely, reliably and efficiently and will also play a critical role in the integration of renewable energy – another pillar of president Obama's energy policy. The proposed policy statement covers critical areas such as cyber-security, communication between market players, wide-area awareness and monitoring and new and emerging technologies such as renewables and energy storage.

FERC said utilities may seek to recover the costs of smart grid deployments that demonstrate system

security and compliance with FERC-approved reliability standards and other criteria.

Smart grid technologies include advanced digital devices that enable the real-time coordination of information from generating units and demand-side resources, resulting in a more efficient bulk power system with reduced emissions. They will also give consumers greater control over their energy usage and costs.

FERC is taking public comments on the policy statement before releasing a final policy statement designed to provide the industry with guidance.

"Prioritizing the development of key standards will speed up the process of achieving an interoperable smart grid," Commissioner Suedeen Kelly said. "Also, our proposed policy will require



Suedeen Kelly: "Prioritizing the development of key standards will speed up the process."

the sharing of information associated with smart grid deployments with the smart grid Clearinghouse being developed by the Department of Energy. This will help to demonstrate the real benefits that investing in a smart grid can bring to the public."

Asia News

Support for Pakistan expansion plan

Pakistan's plans to expand its power sector received a boost from The Asian Development Bank (ADB), which will provide about \$630 million in the next three years for the development of its energy sector.

The assistance will be used for power generation from renewables and hydropower sources, and power transmission projects. The ADB will also provide technical assistance in clean energy development initiatives.

The Water and Power Development Authority (WAPDA) recently said it plans to construct 32 small and medium dams in all four provinces of the country in addition to implementing mega projects in water and hydropower sectors.

The ADB announcement follows a recent agreement signed between Pakistan and China for cooperation in the field of hydropower generation.

Proposals for fast-track independent power producers (IPPs), which will be commissioned in 2010 and 2011, were opened on March 11, 2009 in a meeting held at the Private Power and Infrastructure Board (PPIB) in Islamabad. The bid evaluation committee had earlier declared three bids – 627 MW Engro Power Gen (Pvt) Limited, 171 MW Saba Generation (Pvt) Ltd and 172 MW Reshma Power Generation – as 'responsive' after their evaluation with technical and financial qualification. The bid evaluation committee will now inspect the tariffs and successful bidders will be notified after approval of tariffs by government.

Japan opens up to foreign emissions credits

Ukraine will be the first foreign government to sell greenhouse gas emission rights to Japan to help Tokyo meet its reduction goal under the Kyoto Protocol.

Japan will acquire 30 million tons of emission credits from the Ukrainian government under a contract on so-called Assigned Amount Units, signed between the New Energy and Industrial Technology Development Organization, a Japanese government entity, and the National Environmental Investment Agency of Ukraine.

The Kyoto Protocol requires Japan to cut emissions by 6 per cent from 1990 levels during the period between 2008 and 2012. However, Japan is likely to fall short of its Kyoto commitment by at least 1.6 per cent or about 100 million tons of carbon dioxide equivalents.

To offset this shortfall, Japan has also been negotiating to buy additional credits from other countries that have excess emission rights, including Hungary, the Czech Republic and Poland.

Meanwhile, a key government economic panel said that Japan needs a "revolution to realize a low-carbon society" around the 2020s, which it says will also boost the economy.

Renewable growth despite reduced demand forecast

Despite the economic downturn and contracting power demand, some experts are predicting strong growth in renewables in Thailand due to the support of governments on renewable energy.

In March, the National Policy Commission said it expects to cut its energy consumption projection for the next 12 years by 6408 MW, 11 per cent lower than earlier forecasts.

However, the commission also gave the Electricity Generating Authority of Thailand (Egat) approval to purchase power from alternative energy sources in a bid to conform to a plan to include alternative energy in its plans in 12 years.

Kovit Kantapasara, GE Energy's country executive for Thailand and Indochina, said demand for renewable energy is growing strongly as countries in Indochina have all committed to developing renewable energy to cut their

reliance on mainstream fuels.

"Renewable power projects such as biogas, biomass and wind power do not require much money for investment as most of them are small," Mr Kovit commented. Last year GE Thailand recorded double-digit growth from its operation, thanks to orders from new IPP projects and biogas projects, he said.

GE forecasts that the total power generation market in Thailand this year will be worth \$1.5 billion, with \$1 billion from new small power producers and the rest from maintenance services. Under Thailand's power development plan starting this year, 900 MW of new small power projects (SPPs) would be built.

At the same time, the Finance Ministry recently said that although granting tax incentives for carbon trading could develop greenhouse gas reduction activities in Thailand, it was not "the priority".

Somchai Sujjapongse, director-general of the Fiscal Policy Office, said the ministry has nominated an ad-hoc committee to consider whether incentives should be offered to clean development mechanism (CDM) projects, as proposed by the Thailand Greenhouse Gas Management Organisation (TGO).

"We have to admit that Thailand lags behind regional peers – especially China, Malaysia and even Vietnam – where tax



Somchai Sujjapongse: "Thailand lags behind regional peers."

incentives are granted for carbon trading," he said.

According to Team Thailand at the Royal Thai Embassy in Tokyo, CDM projects in Thailand produce far fewer carbon credits than those in China, India and Brazil due to the lack of government support, poor understanding among related agencies and insufficient credit from banks.

Thailand is likely to face mounting pressure from the global community to cut its greenhouse gas emissions. Key trading partners such as Europe and Japan are likely to use carbon emissions as a non-tariff barrier for both products and services, said Team Thailand.

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India grapples with effects of coal shortages

Coal shortages in various thermal plants of India, including Punjab, are likely to continue even in the next financial year.

The situation persists even as prices of power station coal from Australia, a benchmark for Asia, fell below \$63 a tonne, the lowest in nearly 21 months, as weak global demand led to a build-up in supply.

Power utilities in India have demanded 405 million tonnes of coal for 2009-10. However, Coal India Ltd (CIL) has stated that it would be supplying only 312 million tonnes against the target of 318 million tonnes specified by the Ministry of Power. During the period April 2008 to January 2009, CIL and its subsidiaries failed to achieve targets on many occasions.

In a bid to secure coal supplies for its fuel-starved plants in India, state-run National Thermal Power Company (NTPC) Ltd, the country's largest power generation company, plans to set up power projects in Kazakhstan so that it can import coal from that country.

"NTPC has proven capabilities of installing, operating and maintaining huge thermal power plants and we are very keen to replicate the process in Kazakhstan," said Murli Deora, minister of petroleum and natural gas. "In addition, we are also interested in importing coal from Kazakhstan," he added.

R.S. Sharma, chairman and managing director, NTPC, said: "Kazakhstan has a coal reserve of 35 billion tonnes and

are keen on offering some coal mines to us. We plan to follow the same model that we have firmed up in the case of Nigeria". In Nigeria, the company is trying to finalize a contract for the supply of 3 million tonnes per annum of gas in exchange for setting up a 700 MW gas-based power plant and a 500 MW coal-based plant in the country.

Meanwhile, India took another step towards combating power shortages through advancing its nuclear power programme. At the end of February, the government said it had identified five to seven sites to set up nuclear 'parks', each with a capacity to house at least six nuclear power plants.

Prithviraj Chavan, minister of state in the prime minister's office, said one or more of the sites could house



Murli Deora: India minister of petroleum and natural gas

reactors purchased from the United States, under the Indo-US nuclear deal.

The Indian nuclear renaissance will see several nuclear parks coming up across the country each having four to six plants, Chavan said. While Koodankulam in Tamil Nadu is being developed in collaboration with Russia, French company Areva has been allocated Jaitapur in Maharashtra to set up nuclear power plants, he said.

Chavan said the government was also exploring possibilities of acquiring uranium mines in other countries to ensure fuel supply for nuclear reactors in the country.

Indonesia prepares guarantees

The government is preparing a guarantee scheme for independent power producers (IPPs) involved in its second 10 000 MW programme project.

Energy and Mineral Resources Ministry Purnomo Yusiandoro said, however, the government has yet to clarify how the guarantee would be formulated and to what extent it would give cover. "We will study the form of guarantee that we will produce," Purnomo said on the sidelines of a seminar last month.

The government's guarantee could be in several formats, with different levels of cover: for example sovereign guarantee would mean the government would back the state power firm PT Perusahaan Listrik Negara (PLN) in case the latter failed to pay for electricity, another format would simply comprise an "acknowledgement", according to Purnomo.

"We will evaluate all the possibilities and [once decided] we will include this in a specific presidential regulation," he added.

The second 10 000 MW programme is expected to start in 2012 with power generation starting in 2014. The IPPs are expected to generate about 40 per cent of this capacity.

In mid-March, the government announced that it was holding final preparations for the bidding of a delayed 2000 MW coal-fired power plant in Pemalang, Central Java, as part of its plan to auction off eight infrastructure projects this year. The project is part of the second 10 000 MW programme.

The \$2 billion power plant project is one of eight projects with a total investment of about \$4.4 billion that will be offered by the government this year under the public private partnership (PPP) scheme.

Thirty local and foreign companies have been registered to take part in the bidding process, which is expected to be conducted in May or June. Previously, the government planned the bidding process in February.

EVN must transfer projects

Prime Minister Nguyen Tan Dung has told Electricity of Vietnam (EVN) that any electricity project that is behind schedule must be transferred to other investors.

Dung said the slow pace of construction of projects would contribute to electricity shortages in the coming years, as it did last year when business and production was affected.

Dung also asked the Ministry of Industry and Trade to identify investment priorities by reviewing and adjusting two long-term plans on the electricity industry.

He said EVN should prepare to meet electricity demand, which is forecast to increase between 14 and 15 per cent a year. He also asked the ministry to forecast electricity demand for the next few years.

Last month EVN, said it would kick-off construction of four coal-fired power plants with a combined capacity of 3800 MW this year. The plants will include Nghi Son 1, Mong Duong 1, Duyen Hai 1 and Vinh Tan 2.

This year, the group also plans to put into operation nine power plants with a total capacity of 2700 MW.

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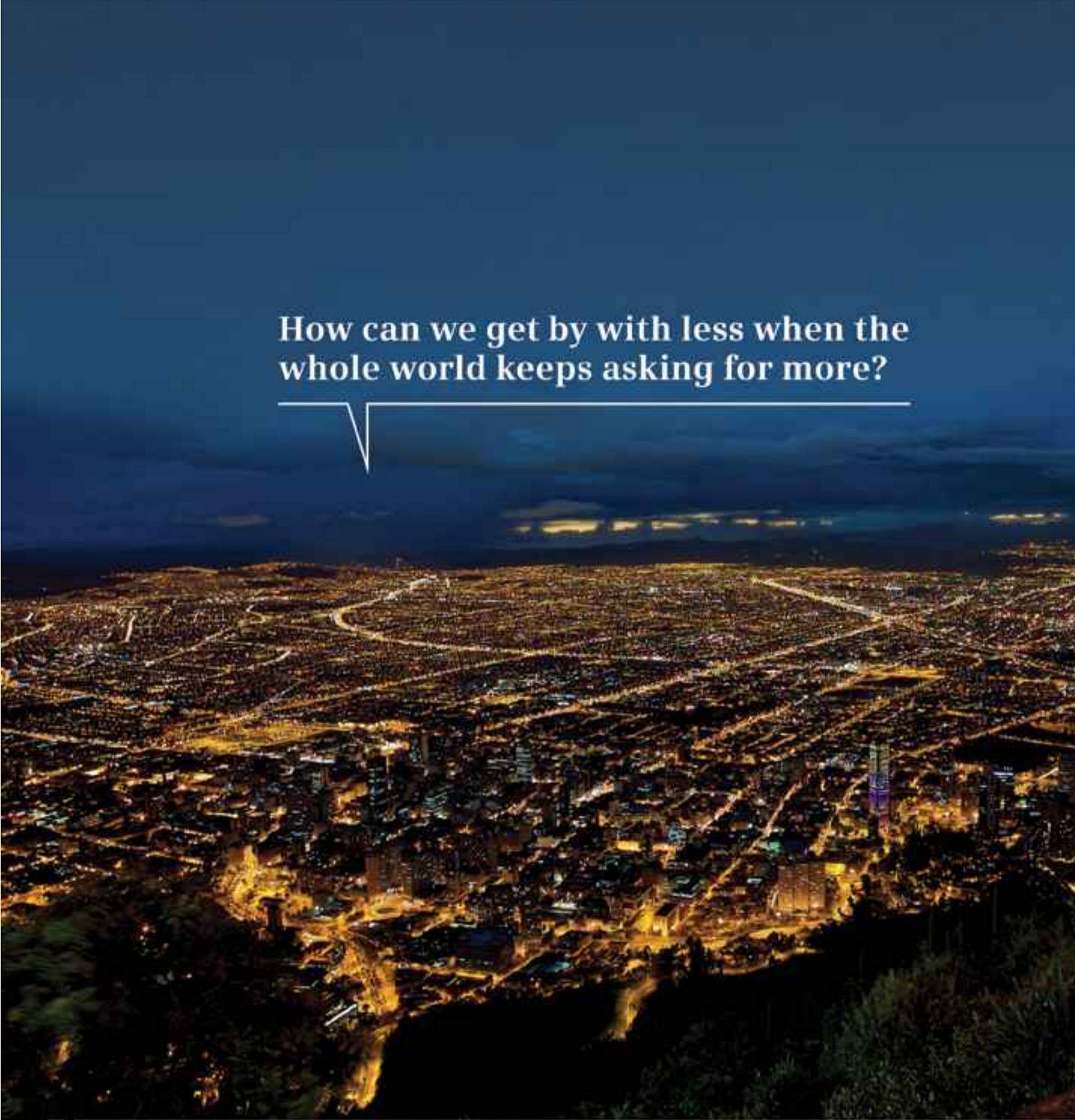
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EU economic stimulus bets on Nabucco

The EU is betting on the controversial Nabucco pipeline as part of a major economic stimulus package but questions remain as to whether the project can deliver, writes Siân Crampsie.

Central and East European countries have claimed a victory in an intense debate within the European Union (EU) over how to allocate a €5 billion funding package aimed at boosting energy security.

The economic stimulus package was approved by European heads of state in mid-March and includes financial support for the Nabucco natural gas pipeline in spite of objections from countries such as Germany and Italy.

It also proposes support for carbon capture and storage (CCS) demonstration projects, offshore wind projects and expansion of the natural gas infrastructure in Central, East and Southeast Europe.

The allocation of €200 million to Nabucco will help to kick-start the controversial project, whose supporters say will reduce the EU's dependence on Russian natural gas. Both Germany and Italy objected to the allocation of public funds to the project on the grounds that work on Nabucco is not scheduled to begin for years and would therefore not immediately stimulate

the economy.

Germany's objection initially led to the removal of Nabucco from the list of priority projects to be funded by the package, replaced instead by the more generic heading "Southern Energy Corridor". Leaders finally agreed on the package after Germany agreed to relent its position, apparently in return for funding for a major offshore wind farm.

As a whole, gas interconnector projects in Europe have been allocated a total of €1440 million and electricity interconnectors €910 million. CCS demonstration projects have emerged another winner, with €1050 million of funds in spite of objections from some critics – again on the grounds that CCS development will do little to stimulate economies in the short term.

Construction on Nabucco is not scheduled to start until 2011, while the commercialization of CCS is several years away. Funds being allocated under the deal will have to be spent by 2010.

Critics have suggested that the money

Nabucco pipeline route

should be spent on energy efficiency initiatives, which would help the EU to achieve climate change and energy security goals as well as reduce consumers' bills.

Other areas supported by the stimulus package – initially proposed by the Commission in January – include offshore wind farm projects, which will receive a total of €65 million.

The €5 billion of funds represents unspent 2008 EU agricultural funding, which the Commission proposed in January should be used to support clean coal projects, offshore wind farms and the deployment of internet broadband connections in rural areas. It initially envisioned €250 million for Nabucco and €1.25 billion for CCS demonstration projects.

The reduced allocation of funds to Nabucco and CCS projects – as well as to broadband internet and agricultural projects – agreed in the final deal means that more money is being spent in two countries badly hit by the recent gas crisis. Slovakia will get support for a gas interconnector

with Hungary, and Bulgaria for an interconnector with Greece.

Infrastructure to permit reverse gas flows between a number of Central and Eastern European countries will be allocated €80 million instead of €75 million.

The €200 million being made available to the Nabucco consortium – which consists of OMV (Austria), MOL (Hungary), Transgaz (Romania), Bulgargaz (Bulgaria), BOTAS (Turkey) and RWE (Germany) – is essentially a loan but is symbolically important, according to Datamonitor analyst Kash Burchett.

"The loan comes at a time when credit markets have all but seized up and securing finance for any project, let alone one as risky as Nabucco is difficult," said Burchett. "The European Commission, which has continued to back the project in the face of mounting obstacles, can legitimately view this as a victory."

The Commission's support of Nabucco is also a snub for Russia, which has been promoting its South

Stream pipeline – designed to bring Russian gas to Europe through Bulgaria. Germany is also supportive of the Nordstream project, a proposed 1220 km pipeline bringing Russian gas via the Baltic Sea.

The future of the Nabucco pipeline is by no means assured, according to Datamonitor, partly due to its lack of secured upstream reserves and its total estimated cost of €10.2 billion. Turkey is also starting to flex its muscles as its confidence as the new Eurasian energy hub grows, making demands that may cause turbulence in the future.

This position leads to two key questions, says Burchett: "Firstly, will Turkey follow Ukraine's example and become more bullish in exacting transit fees? If so, this could prove an even bigger obstacle to Nabucco's eventual realization than securing upstream reserves."

"Secondly, and perhaps more importantly, does shifting dependence from Russia and Ukraine to Turkmenistan and Turkey necessarily improve security of supply?"



Low carbon will cost, says report

■ UK energy companies need to double rate of investment

■ Grid investment model welcomed by renewables sector

The UK government has set tough greenhouse gas emission reduction targets but a report published in late February by Ernst & Young (E&Y) indicates that energy companies will need to double their rate of investment to meet government objectives. Utilities have also called on the government to develop fiscal incentive measures to encourage the development of carbon capture and storage (CCS) technology.

In its report – commissioned by Centrica – E&Y says that by 2025 the

industry will need to invest £234 billion in new wind farms, nuclear power stations and grid connections. They will need to earn twice as much profit to finance that investment and the figures imply a steep increase in energy bills.

The government recently launched a new research programme known as "Avoid" aimed at improving the evidence base on the science of climate change, and has also given its backing to a proposed new model of grid

investment that would speed up the connection of new power stations to the transmission network.

The new grid investment model, which would involve allowing utilities to make "anticipatory" investments, has been welcomed by the renewables industry as securing grid connections is one of the biggest hurdles to the growth of renewable energy in the UK.

The E&Y report is an update of a study published in 2008, which said that investments would need to reach

£165 billion by 2020. A major part of the increase in investment needs is down to the increasing costs associated with the construction of offshore wind farms and new nuclear power plants.

The figures given in the report raise the issue of raising finance in the current economic climate. E&Y believes that to attract the required investment, the energy industry will need to pay a real-terms return of about 12 per cent, implying a doubling of profits by 2028.

Italy, Serbia sign cooperation deal

■ Renewable projects earmarked

■ PEOP promoted

Serbia has enlisted the help of Italy in its bid to expand and upgrade its electricity sector through a protocol on energy cooperation between the two countries.

Serbian energy minister Petar Skundric and Italian minister for economic development Claudio Scajola signed the protocol last month and say that the document envisages the implementation of a range of projects in the renewable energy, power transmission, gas and oil sectors.

The prospect of such projects is a boost for Serbia, which, like other southeast

European nations, has committed to reforming and modernising its energy sector under the EU's Athens process. The deal will give Italian companies the opportunity to participate in key projects.

Projects earmarked under the deal include the construction of small and medium hydropower plants, wind farms, solar photovoltaic plants and biomass plants. The two countries have also pledged to promote the Pan-European Oil Pipeline (PEOP), which aims to bring crude from the Caspian basin via the Romanian Black Sea port of Constanta to Trieste in Italy.

Greece to join green "club"

Greece is planning to become one of the few nations in the world able to boast the presence of a "green island" in their territories by transforming the electricity sector of one of its own islands.

Greek development minister Costis Hatzidakis has announced that the small and remote northern Aegean island of Aghios Efstratios is to source all its energy needs from renewables. If successful, the project will be replicated on two other, slightly larger islands.

So far, only three truly "green" islands exist in the world: King Island in Australia, Samsøe in Denmark and Utsira in Norway. On Aghios Efstratios, pilot projects budgeted at €10 million are planned that will replace the island's oil fired generators with wind turbines, solar photovoltaic systems and a biomass unit.

The project will also replace all mass transport fleets with electric-powered vehicles, and is scheduled to be complete by the end of the year.



Ukraine seeks EU support

Ukraine's need for political and financial support from west European allies is leaving Russia out in the cold, writes Siân Crampsie.

Yulia Tymoshenko: getting closer to the EU

Ukraine is attempting to shore up its reputation in western Europe amid signs that the row over natural gas supplies from Russia is set to rumble on.

The country's prime minister Yulia Tymoshenko has sought help from France to revive its nuclear energy sector and has also secured a deal in Brussels for assistance with a major project to upgrade Ukraine's ageing natural gas pipeline infrastructure.

In a recent visit to Paris, Tymoshenko sought to reassure European gas consumers that there would be no more disputes with Russia over gas supplies. However, the new EU-Ukraine gas pipeline modernization plan – signed in mid-March – appears to have angered Moscow.

Ukraine is highly dependent on Russia for energy supplies and is also a key transit country for the delivery of Russian gas to the EU. A row over the price of natural gas erupted between the two countries in late 2008 and dragged on into 2009, disrupting supplies to several European countries.

The row not only represented a major

deterioration in the already difficult relationship between Moscow and Kiev, but also highlighted the dependence of Europe on Russian energy supplies and the difficult task the European Commission faces in handling its relationships with the two governments.

Now Russian prime minister Vladimir Putin is reported to have threatened to review his ties with the EU because of the Commission's decision to assist in the modernization of Ukraine's 13 500 km pipeline system. It is estimated that the 40-year old system requires investments of around €2.5 billion in order to keep it functioning.

Russia claims, however, that some of the provisions in the EU-Ukraine declaration run counter to the long-term agreement covering gas supplies that it signed with Ukraine in January 2009. It also believes that it should be included in plans to upgrade Ukraine's gas system.

"The declaration adopted in Brussels does not take into account the agreements and arrangements between

Russia and Ukraine in the gas sector, specifically on the creation of an international consortium for the development and management of the Ukrainian gas transportation system," a Russian Foreign Ministry spokesman was quoted by the *Itar-Tass* news agency as saying.

"The Ukrainian gas transportation system is technologically connected with Russia's gas transportation system, and any actions to modernise it that have not been coordinated with Russia will increase technological risks and may disrupt natural gas supplies to Ukraine and Europe," the spokesman said.

The EU has a keen interest in ensuring the smooth running of Ukraine's natural gas system as some 20 per cent of the bloc's natural gas supplies come from Russia via Ukraine. It also recognises the importance of Russian energy supplies, and set out plans for improving energy independence in the 27-nation bloc in last year's Strategic Energy Review.

Ukraine is also trying to reduce its dependence on Russian gas, and

Tymoshenko is reported to have met with Areva representatives in Paris to discuss projects to extract Ukrainian uranium and build new nuclear power plants.

Ukraine is keen to gain support within the EU in order to help it counter Russia's accusations. A similar row over gas supplies between the two countries in 2006 brought sympathy for Kiev from within the EU, but its decision to hold out against Moscow in the latest row caused the dispute to go on for several weeks and led to major disruptions to energy supplies across Europe.

European governments have therefore been less than sympathetic towards Ukraine's government since the dispute, especially as the country stockpiled massive quantities of natural gas over the winter.

Ukraine's economy is highly sensitive to natural gas prices as its main industries – steel and fertilizers – use large quantities of the commodity. Upcoming presidential elections in the country are also a key element in its government's position.

Central Asian energy crisis forces blackouts

■ Row highlights resource shortages
■ Tajikistan plans new hydro capacity

A recent move by Kazakhstan to protect its energy supplies has disrupted electricity supplies to neighbouring central Asian countries.

Kazakhstan says that it has pulled out of the Central Asian power grid because Tajikistan was taking more energy from the grid than it was producing, threatening to disrupt supplies in Kazakhstan.

The withdrawal of Kazakhstan from the grid has forced rolling blackouts and electricity rationing in Kyrgyzstan, one of five countries operating in the Central Asian power grid. It has also highlighted the problem of resource-

sharing in a region desperate to upgrade its energy infrastructure in order to help boost economic growth.

State-owned Kazakhstan Electricity Grid Operating Company said that in February, Tajikistan made unscheduled use of 84 million kWh of energy. Kazakhstan's decision to pull out of the grid has forced Kyrgyzstan to ration electricity supplies in the north of the country.

All five countries suffer from energy shortages – particularly during winter – a problem exacerbated by the state of the Soviet-era infrastructure. The shortages are a threat to continued



Kazakhstan: moving to protect supplies in the capital

economic growth in the region.

Frequent power outages are already a problem in Kyrgyzstan, where investment needs in the electricity generation and distribution sectors are described as "urgent" by multi-lateral lending institution the EBRD. The country relies heavily on hydropower and its reservoir levels are thought to be dangerously low following exceptionally cold weather.

The sourcing of financing for energy infrastructure projects in central Asia has also become more difficult in the current global financial conditions. Tajikistan has secured investment from

Russia for the construction of three new hydropower plants but current regulatory and financial conditions in many central Asian countries make them too risky for most foreign direct investment.

Tajikistan is already suffering from chronic power shortages and has major weaknesses in its electricity industry, says the EBRD. The country recently secured a deal to receive 1.2 billion kWh/year of electricity from Turkmenistan, but the arrangement fell through earlier this year after Tajikistan failed to agree on a transit deal with Uzbekistan.

Russia initials nuclear deals

■ Russian demand slowing

■ Jordan signs storage deal

Russia is seeking to boost the export of its nuclear expertise and equipment as falling electricity demand in its own territory threatens to put the brakes on a number of new construction projects.

State-owned nuclear company Rosatom has signed a memorandum of understanding (MoU) with Nigeria's Nuclear Regulatory Authority to cooperate in the nuclear energy field, and has also initialled a similar deal with Jordan.

The two deals extend Moscow's growing number of alliances in the international nuclear energy field and came as the head of Rosatom Sergei Kiriyenko announced that the manufacture of equipment for up to four new nuclear power plants under construction in Russia could be held back due to reduced electricity demand.

Russia's deal with Nigeria paves the way for a formal intergovernmental agreement for cooperation in the peaceful use of nuclear energy. It could pave the way for Russian firms to design, build and operate nuclear power plants in Nigeria, which is looking to nuclear energy to help overcome an acute power crisis.

Jordan's deal with Russia paves the way for Russian companies such as Rosatom to build nuclear plants for the generation of power and for water desalination. Jordan has also signed similar deals with Canada, France, South Korea, China and the UK.

Jordan imports more than 95 per cent of its energy needs and has committed to the construction of nuclear power generation capacity to enhance energy independence. In March the Jordan Atomic Energy Commission signed a deal with the US government for assistance in the construction of a nuclear waste storage facility.

Under the deal, the US Department of Energy will provide Jordan with \$370 000 for the construction of a national central storage facility (CSF). The facility will hold Jordan's radioactive waste for five decades in compliance with IAEA guidelines.

AfDB boosts Egypt project

Egypt's plans to prioritise the expansion of its electricity infrastructure have received a boost with the signing of a loan agreement for a major new coal fired power plant construction project.

The African Development Bank (AfDB) has committed to a \$450 million loan for the construction of a 1300 MW supercritical power plant near Ain Sokhna on the Gulf of Suez. The development of the new plant will help Egypt to meet the rapid growth in electricity demand, which is rising at over six per cent per annum.

The loan is a long-term foreign currency financing that represents 22 per cent of the total cost of the project. The rest of the project's cost will be covered by the Egyptian Electricity Holding Company (EHEC), the World Bank, the Arab Fund for Social and Economic Development and the Kuwait Fund for Arab Economic Development.

The project is a feather in the cap for the Egyptian government's 6th five-year development plan (2007-2012), in which the expansion of electricity infrastructure is a major priority.

Areva faces T&D sell-off

French nuclear firm Areva needs cash to fund its growing operations and may end up selling its successful T&D business back to Alstom, writes Siân Crampsie.

Areva is likely to be forced to sell-off some of its assets as part of a strategy to raise much needed finance for its operations in the growing global nuclear market.

The French engineering group announced in February that losses at its high-profile EPR reactor project in Finland had affected earnings, and is also reeling from the exit of Siemens from its Areva NP nuclear partnership. Areva has estimated that it needs €2 billion in new financing in the next four years to meet investment needs.

The funds could come from a sell-off of assets, a capital increase by its main shareholder – the French government – and the sale of minority stakes in the company to strategic partners or investment funds. The possibility of the sale of its

transmission and distribution (T&D) division to Alstom has also been raised, according to French press reports.

Areva has made a €749 million provision in its 2008 annual results to account for delays and cost overruns at Finland's Olkiluoto 3 nuclear power plant. The €3 billion project has now accumulated €1.7 billion in estimated losses, and this could rise due to the on-going lawsuit between Areva and partner Siemens, and their Finnish client, TVO.

Areva's relationship with Siemens also appears to have deteriorated, with Areva informing its German partner in March that it breached the terms of their shareholders' agreement when it announced an agreement to create a nuclear joint venture with Rosatom. Areva will have to buy Siemens' stake



The Olkiluoto 3 nuclear power plant in Finland is facing an estimated €1.7 billion in losses

in Areva NP, valued at €2 billion. Siemens announced in January its decision to pull out of the Areva NP joint and moved quickly to start negotiations with Russia's Rosatom to secure a place in the growing nuclear market.

A statement from Areva said: "Areva points out that Siemens with its 34 per cent share in Areva NP has a number of compulsory obligations under the shareholders' agreement dated January 30, 2001, which in particular contains a non-competition clause."

Areva's earnings have also been hit by a fall in uranium prices. Net profits in 2008 stood at €89 million, down 20 per cent from €743 million in 2007.

Operating income fell by 44.5 per cent in 2008 to €417 million. The problems that the company is

experiencing in Finland raises the prospect of increased costs at other proposed EPR projects around the world.

Areva's success in selling its EPR technology abroad is reflected in its annual results, which showed a ten per cent rise in sales across the whole group. Today there are more EPR reactors being planned than any other new generation reactor.

The difficulties faced by the state-owned group have put the French government and Areva's chief executive Anne Lauvergeon under pressure. The idea of merging Areva with Alstom to create a French engineering "champion" – a move opposed by Lauvergeon – now looks to be unlikely as it could be politically unacceptable for French president

Nicolas Sarkozy.

The French government is now thought to be likely to provide a capital increase in the firm provided that some of its assets are sold. This could include Areva T&D, the unit that Areva originally bought from Alstom in 2004.

Lauvergeon is thought likely to oppose the sale of the T&D division, whose operating income rose by over 40 per cent in 2008.

Another option for the French government is the sale of minority stakes in Areva to strategic partners or investment funds in the Middle East, according to the *Financial Times*. This move could boost the firm's profile in the Middle East, where governments are turning to nuclear power as a means of meeting rising energy demand and preserving oil resources.

CEZ finalizes OSSH stake

CEZ says that its participation in the Albanian electricity market will help to significantly improve supplies in the country.

The Czech power utility has continued its campaign to expand throughout central, east and southeast Europe, winning an international competitive tender to purchase a 76 per cent stake in Albanian distribution company OSSH. The firm recently bought Turkish grid firm SEDAS and has also signed a contract to acquire German coal mining firm Mibrag.

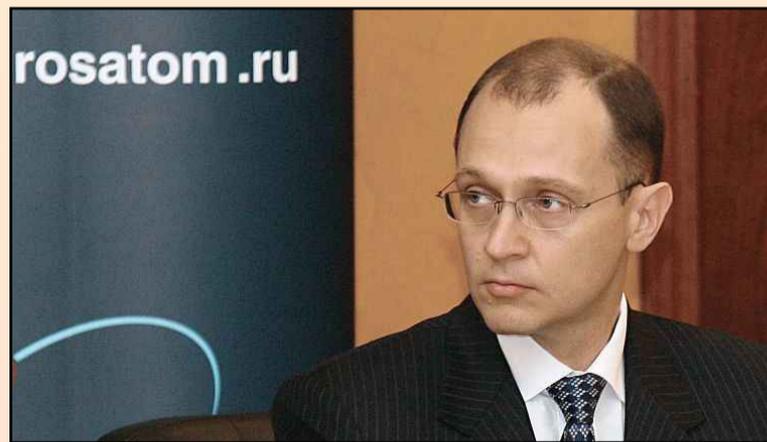
CEZ has paid €102 million for its stake in OSSH, which supplies around 5.3 TWh to nearly a million customers annually. The company says that it will use its experience of restructuring in countries such as Romania and Bulgaria to benefit Albanian consumers.

"For CEZ it is another step in consolidation of our position in southeast Europe," said Martin Roman, Chairman of the Board and CEO of CEZ. "From a long-term point of view analysts expect that the electricity consumption in Albania will grow by five per cent each year; a faster rate in the region is experienced only in Turkey where the CEZ Group operates as well."

Albania suffers from chronic electricity shortages caused mainly by a lack of investment in infrastructure, according to CEZ. Per capita electricity consumption is approximately one-quarter of that in most west European countries, and the country is heavily reliant on electricity imports.

Siemens inks partnership deals

- Long-term partnership with Fluor
- New nuclear strategy with Russian partner



Strategic partner: Rosatom's Sergey Kiriyenko

Siemens and Fluor are hoping that a long-term cooperation agreement will help them to streamline the planning and execution of power projects around the world.

The strategic alliance will enable both companies to coordinate their work and planning processes, with their focus being to risk minimization and the acceleration of planning and execution of major projects. Fluor will take advantage of Siemens' product range in the oil and gas, power transmission and distribution, industrial automation, drive technology and industrial solutions divisions.

The deal is in line with Siemens'

strategic re-focussing of the ratio between the turnkey and component business with a shift towards more component business.

"As a result of this long-term partnership, Siemens can be involved in project development right from the beginning," said Wolfgang Heuring, Siemens' Corporate Executive Sponsor for Fluor and CEO of Siemens Energy's Medium Voltage business unit. "We can thus simplify the project development process and make optimum use of the resources of the two companies. The two businesses will decide on a case-by-case basis how Siemens can provide the end

client with the best possible support."

The deal came as Siemens signed a memorandum of understanding (MoU) with Russia's Rosatom to create a joint venture in the nuclear field. The two companies say that the agreement – if finalised – could make them world leaders in the international nuclear power business.

Siemens' agreement with Rosatom follows its decision to pull out of its nuclear joint venture with Areva in January. The two companies hope to formalise the agreement in May, creating a joint venture with Rosatom holding 50 per cent plus one share.

The proposed joint venture will initially focus on the development of Russian VVER reactor technology as well as marketing, sales, new plant construction and the upgrade and modernization of existing nuclear plants. Siemens brings to the partnership extensive knowledge of the conventional islands of nuclear power plants as well as project management experience.

The Russian firm is the only company in the world that covers the entire nuclear value chain and the partnership potentially gives Siemens access to a wide range of business opportunities.

Siemens forecasts that by 2030, some 400 new nuclear power plants will have been built, representing a total investment of more than €1000 billion.

E.On reviews investments

E.On has said that the global economic crisis means that the outlook for its business in 2009 is "subject to significantly more uncertainty than outlooks of previous years".

The German utility is looking to cut costs and consolidate its position after a period of rapid expansion, but says that it plans to continue with its €63 billion investment programme, the largest in the energy industry. It will, however, review its business portfolio and divest at least €10 billion of assets by the end of 2010.

E.On reported a rise in gas and electricity sales during 2008, contributing to full-year adjusted earnings before interest and taxation, depreciation and amortization (EBITDA) of €13.4 billion, a rise of eight per cent over 2007. There are concerns, however, that sales could fall during 2009 due to the economic crisis and its effect on power demand from large industrial users.

E.On says that it invested €26.2 billion in 2008, more than twice as much as in 2007. From late 2007 to 2008 it acquired a raft of major assets, including Russian generator OGG-4 and assets in Spain, Italy and France.

The Dusseldorf-based company also reported in March that by 2010 it will have invested €60 billion of the €63 billion of planned investments for the period 2007-2010. However, E.On plans to review investment plans for 2009-2011 and reduce the figure by around €6 billion.

Tenders, Bids & Contracts

Americas

AEP orders flywheel system

American Electric Power (AEP) and one of its subsidiaries, Columbus Southern Power Company, have signed a contract with Beacon Power Corporation for the supply of a 1 MW flywheel energy storage system.

The contract entails the construction of a 1 MW Smart Energy Matrix regulation facility in Groveport, Ohio, USA that will be connected to the grid within the PJM Interconnection operating system. When commissioned in 2009, the flywheel system will provide frequency regulation services to PJM and will be monitored by the utilities as well as Beacon.

AEP will provide the site and certain integration services in support of the project, and in exchange gain in-depth knowledge about the performance of Beacon's system and its impact on frequency regulation and grid stability.

Siemens wins turbine service contract

Iberdrola Renewables has awarded Siemens Energy a long-term service contract for the Klamath Energy plant in Klamath Falls, Oregon. The contract includes a long-term maintenance programme as well as modernization upgrades to the plant's combustion turbines and control system.

Under the agreement, Siemens will upgrade the two SGT6-5000F combustion turbines at the 500 MW gas-fired plant, increasing base load plant power and improving heat rate. It will also carry out generator rewinds, provide a new inlet heating system and install a SPPA-T3000 control system.

Asia Pacific

AGL orders Suzlon wind turbines

AGL Energy has signed an agreement with Suzlon Energy Australia for the supply of wind turbines for its pipeline of projects in Australia.

Under the contract, Suzlon Energy Australia – a unit of Indian wind turbine manufacturer Suzlon – will supply 54 of its S88 2.1 MW wind turbine units. The turbines will be installed in 2009.

BHEL wins Malwa contract

Bharat Heavy Electricals Limited (BHEL) has won a Rupees31.5 billion order to supply the main plant package for the Malwa thermal power plant project in Madhya Pradesh, India.

BHEL said that it won the order by participating in an international competitive bidding process held by Madhya Pradesh Power Generating Company Limited (MPPGCL), and that it will equip the plant with two of its newly-rated boiler units. The first unit at the greenfield site is scheduled to go on-line in 2012.

BHEL's scope of work will include the design, engineering, manufacture, supply, erection and commissioning of steam turbines, generators, boilers and associated auxiliaries, including transformers, bus-ducts and controls and instrumentation.

Invensys to supply Gujarat DCS

Invensys Process Systems (IPS) has won a multi-million dollar contract to supply a distributed control system (DCS) for a 3300 MW power plant in Gujarat, India.

The US firm will deploy its Foxboro

I/A Series DCS at the plant. The new plant, located in Kutch, Gujarat, is one of the largest plants under construction in India.

Under the terms of the contract, IPS will provide I/A Series automation hardware and software, as well as a range of installation, engineering, training and field services. The systems will be used to control the new plant's boilers, turbines and generators and will use IPS's Performance Plus coordinated control system technology.

China attracts solar bids

As many as 50 companies have placed bids to develop a major solar photovoltaic power project in northwest China's Gansu province.

Local news reports indicate that both local and international companies have submitted bids to build the 10 MW facility, which will cover an area of 10 million m² in Dunhuang city. The plant will cost around \$75 million to build and will generate around 16 million kWh/year.

Chinese firms that have submitted bids include China Datang Corporation, China Huadian Corporation, China Power Investment Corporation and Suntech Power Holdings Co., Ltd. The winning bidder will complete construction of the plant within 18 months and operate it for 25 years.

FW to design Korean gasification island

Foster Wheeler Italiana has been awarded a contract by Doosan Heavy Industries & Construction to carry out the Front End Engineering Design (FEED) and technical services for a new gasification plant in South Korea.

The plant will be based on Shell technology and will be built at an existing coal fired power plant. The project is being partially supported by the Korean government as part of national research, development and demonstration programmes.

Foster Wheeler will undertake the FEED as well as provide procurement assistance for long-lead items, develop a capital cost estimate, and provide technical training on gasification and technical support during the EPC phase. The IGCC plant is expected to be completed by the end of 2014.

LTSA win for GE in China

GE Energy has signed two service and maintenance agreements worth a total of more than \$128 million for two power plants in China.

The US company is to provide inspections and service for two GE 9FA gas turbines at the Zhejiang Zheneng Zhenhai power plant in Ningbo. The plant, which is the biggest gas turbine combined cycle plant in Zhejiang province, has an output of 796 MW.

GE has also signed a long term contractual service agreement (CSA) with the Fujian Refining & Petrochemical company to handle all parts, repairs and service for two GE 9Es at the company's site in Quanzhou, Fujian province. The contract is China's first CSA for 9E units, according to GE.

Europe

Ultra-supercritical boilers for Eemshaven

Alstom has been awarded a contract worth around €500 million by RWE Power AG to supply two ultra-supercritical boilers for its Eemshaven power plant in the Netherlands.

When completed in 2013, the new 800 MW boilers will be among the most efficient of their kind, allowing

the plant to achieve an electrical efficiency of approximately 47 per cent. The new units are designed to co-fire up to 10 per cent biomass, an important renewable energy option. The units can be retrofitted at a later date with equipment used to capture CO₂ after combustion.

CE Electric orders GIS indoor substation

The UK's CE Electric is continuing its project to upgrade the electricity network in the north of England with the award of a \$28 million turnkey contract to ABB.

Zurich-based ABB is to design and build a new 16-bay indoor gas insulated switchgear (GIS) substation in West Yorkshire, replacing an existing outdoor air insulated switchgear substation that is nearing the end of its service life. The new facility will occupy one-quarter of the land of the existing substation and will help to improve the reliability of electricity supplies in the area.

ABB will be responsible for the design, construction, supply and installation of the new substation, supplying 16 bays of ABB's ELK 132 kV GIS equipment, 132 kV XLPE (cross linked polyethylene) cables, protection equipment and low voltage AC/DC supplies. It will also modify the terminal towers for the overhead lines and the existing sealing end platforms to adapt them for the new installation.

Siemens to supply 500 offshore wind turbines

Dong Energy and Siemens have signed an agreement for the supply of up to 500 offshore wind turbines to be deployed on Dong Energy's pipeline of projects in northern Europe.

The supply agreement is the largest of its kind in the world and will result in the installation of up to 1800 MW of offshore wind capacity over the next few years. Siemens will supply its 3.6 MW turbines similar to those that are currently in operation at Dong's Burbo Banks offshore windfarm.

Barking upgrades controls

Barking power station, one of the UK's largest independently-owned power plants, has awarded Emerson Process Management a contract to replace its outdated operator stations with an Ovation system.

Under the contract, Emerson will replace the ABB Bailey Operator Interface Stations that are connected to the existing Bailey INFI 90 system. The Ovation expert control system will interface with the existing proprietary controllers and other third-party products, providing Barking Power with freedom of choice for future automation upgrades.

International

Kuwait awards substation contract

Kuwait's Ministry of Electricity and Water has awarded ABB a \$400 million order for equipment that will improve the country's electricity transmission grid.

ABB will design, supply, install, test and commission three new substations that will increase transmission voltage from 300 kV to 400 kV as well as improve grid reliability. The project is scheduled for completion in 2011.

Key components to be supplied include gas insulated switchgear, 12 large power transformers, low voltage auxiliary systems and network control and protection equipment. The higher voltage will also help to meet rising demand for electricity in the country,

and enable the grid to be connected to neighbouring Gulf Cooperation Council (GCC) countries.

Eskom signs up Alstom for nuclear upgrade

French engineering group Alstom has signed a contract with South Africa's Eskom to retrofit the low pressure turbines at the country's only nuclear power plant.

The project will increase the output of the Koeberg nuclear power plant, improve reliability and availability as well as extend the lifetime of the plant. The contract is worth €125 million and follows the award of contracts to Alstom by Eskom to supply equipment for two major new coal fire power plants in South Africa.

The retrofit project on the plant's two 970 MWe units will be carried out during planned refuelling outages in order to reduce the chance of interruption to operations at the facility, said Alstom. Koeberg is of particular importance to electricity supplies in Western Cape province.

Kepeco selected for Rabigh

A consortium led by Korea Electric Power Corp (Kepeco) has been selected as the preferred bidder to construct a \$2.5 billion, 1200 MW power plant in Saudi Arabia.

Kepeco submitted a bid to build and operate the oil-fired Rabigh power plant in conjunction with ACWA Power International, a Saudi Arabian company. The consortium is planning to sign a formal deal with Saudi Electricity Company (SEC) in the near future.

If the deal is finalised, Kepeco and ACWA will build the plant in the city of Rabigh by 2013, and operate it until 2033. The two firms will each have a 40 per cent stake in the project, while SEC will own 20 per cent.

Alstom wins hydro contracts

Alstom Hydro has been awarded two major contracts to rehabilitate two hydropower plants in Africa.

The French engineering firm is to overhaul the 260 MW N'Seke hydropower plant in the Democratic Republic of Congo (DRC) as well as rehabilitate the main equipment of the 260 MW Cambambe plant in Angola. Together the contracts are worth more than €50 million.

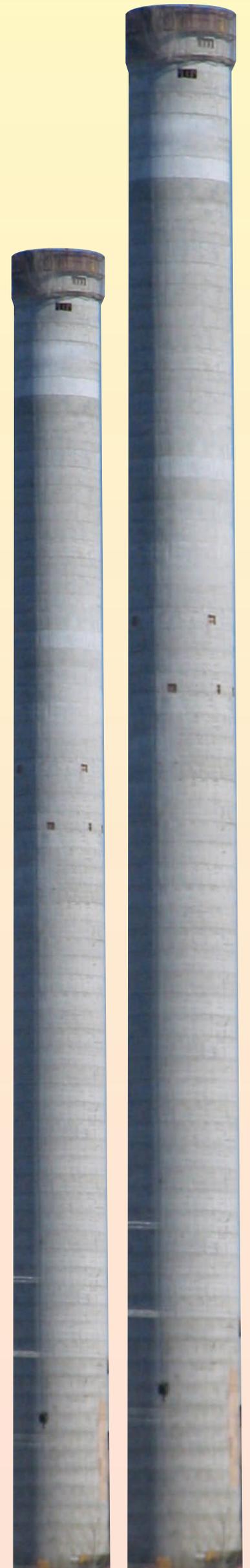
Under its contract with DRC utility Société Nationale d'Electricité (SNEL), Alstom is to rehabilitate the plant's four 65 MW turbine generator units. The work also includes rehabilitation of the balance of plant and the supply of hydro-mechanical equipment.

At the Cambambe plant, located on the Kwanza River, Alstom's scope of work includes the supply, erection supervision and commissioning of four 72 MVA generators, the supply and integration of new digital protection and control systems as well as hydro-mechanical and lifting equipment.

SEC awards GIS substation contract

The Saudi Electricity Company (SEC) has awarded ABB an \$18 million contract to supply 380 kV gas insulated switchgear (GIS) equipment for a new substation in western Saudi Arabia.

The substation will reinforce the utility network and improve power supply to the city of Mecca. ABB's scope of supply includes 15 circuit breakers with control panels, which will be installed, tested and commissioned in a fast-track project scheduled for completion in around 18 months.



Driving renewable growth

The US has the world's largest installed base of renewable generating capacity but further incentives and legislation are needed for growth in the tough economic climate.

Georgina Benedetti

The US is the world leader in geothermal, biomass, and concentrating solar power (CSP) installed capacity. However, renewables still represent less than five per cent of the installed generating capacity. Solar and wind energy are the fastest growing renewable technologies, and it is expected that their market share will continue to increase. However, the major challenge to their growth is in reducing costs.

In general, renewable technologies are very capital intensive. In the photovoltaic (PV) solar energy market, PV modules represent 40 to 60 per cent of the total installed cost of a solar system. Therefore, it is the main element in the final cost of a complete solar system.

From 2006 to 2008, PV module prices increased as a result of the massive demand for silicon from solar makers and computer chip makers. The increased demand coupled with the tight supply, resulted in a significant shortage of solar-quality silicon in the solar industry, which raised manufacturing costs and impacted on module prices.

The rapidly growing demand from the increasing number of solar cell manufacturers induced solar-grade silicon manufacturers to invest in new capacity in recent years. This will bring down PV module prices as new manufacturing capacity comes on line in 2009 and 2010.

The removal of the \$2000 cap and an eight-year extension of the 30 per cent federal solar tax credit for homeowners that was included in the federal government's \$700 billion financial industry bailout and stimulus plan is also expected to decrease the cost of PV modules. The long-term policy stability that this incentive provides to the solar market is expected to increase companies' investment in new manufacturing capacity, thereby

With regards to wind, even though government incentives have reduced the initial investment cost of projects, there are a number of factors that have increased their total cost. Some of these factors include: shortages of turbines and components, as a consequence of the increased demand from the US and European markets; the declining US dollar relative to the euro (the majority of the turbine components are imported from Europe); significant increase in raw material costs, especially steel and copper; and the intermittency of the wind energy production tax credit (PTC).

The recent three-year extension of the PTC and the option of converting tax credits into direct cash are expected to reduce wind energy project costs over the next few years.

A longer extension of the PTC, however, should further reduce costs by allowing turbine manufacturers to expand domestic manufacturing facilities and enabling project developers to enter into longer-term supply agreements with the manufacturers.

According to the National Renewable Energy Lab (NREL), an extension of the PTC through 2020 could stimulate enough wind power to serve as much as 17 per cent of the nation's electricity supply by 2030.

Due to the high cost of equipment, government incentives are necessary for renewable energy technologies to compete in terms of price with grid supplied electricity from thermal power plants.

In the case of solar, this suggestion is proven by the fact that, despite poor sun conditions potentially cutting solar power output in half, there is far more solar consumption in cloudy regions with solar incentives than in sunny regions with no incentives. For instance in the US, the state with the best market for solar power is California, which combines high quality sunlight in southern California with extensive solar incentives supported by the state legislature and the governor.

The combination of rebates for home solar installation and the ability to sell excess solar power through the grid has made solar affordable and competitive in California and other states with similar incentives.

The PTC has helped level the economic playing field for wind projects in energy markets. Currently, in many parts of the US, the PTC has helped in reducing the electricity price generated by wind power plants to less than 5 cents/kWh, making wind energy competitive with new coal- or gas-fired power plants.

Incentives and regulations play an important role in stimulating the renewable energy market.

The Renewable Portfolio Standard (RPS) is a regulatory policy that requires retail electricity suppliers to set a minimum share for electricity production from renewable energy resources, or for the purchase of tradable credits that represent an equivalent amount of production. The share varies from 10 to 25 per cent, and definitions of renewable energy differ in different states.

Towards the end of 2008, Canada, 26 US states, and the District of Columbia adopted the RPS. Five other states, including Michigan, Missouri, North Dakota, Virginia and Vermont, have set voluntary goals for adopting renewable energy, instead of portfolio standards with binding targets.

The main advantage of this policy is that it not only increases clean energy

generation and reduces greenhouse gas emissions, but it also benefits the renewables market by providing predictability and capital investment, while allowing the manufacture of equipment to achieve economies of scale. In addition, this mechanism encourages market competition, reducing renewable energy prices and, therefore, the costs of compliance with the requirement.

As one indicator of the role of state RPS programmes, about 80.6 per cent of non-hydro renewable net summer capacity in the US in 2007 is installed in states with active, mandatory RPS policies, totalling 23 584 MW.

President Barack Obama's economic stimulus package includes major initiatives for the promotion of renewable energy technologies such as tax credits, renewable energy loan guarantees and grants, renewable energy research funds, renewable energy manufacturing investment credits, and new renewable energy bonds.

But even though the three-year extension of the PTC and the other initiatives included in the stimulus bill are expected to provide policy certainty and drive market growth, the economic recession could lessen the market growth to some extent during 2009.

The solar energy market is expected to grow at a CAGR of 39.9 per cent from 2009 to 2015, reaching 12 129 MW in 2015. Installed wind energy capacity is projected to increase at a CAGR of 31.6 per cent during the forecast period, from 27 056 MW installed in 2009 to 140 686 MW in 2015.

Obama's plan to double renewable energy production in the next three years seems a big challenge when considering renewable energies still represent less than five per cent of the overall energy supply, installed capacity, and electricity generation in the US.

In addition to current initiatives to maintain rapid growth of the sector, the new administration's plan should evaluate other actions that are considered important by market participants.

A consistent, long-term policy is needed to enable more significant cost reductions. State and federal legislation should ensure that incentives will be available for periods of 5-10 years or more.

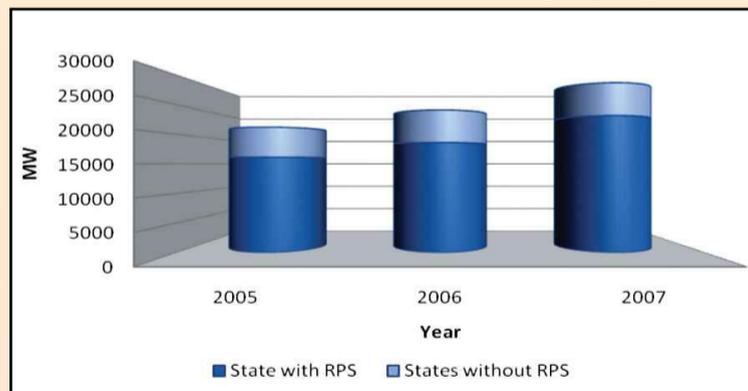
A renewable portfolio standard should be set up at the federal level in order to: specify renewable generation capacity targets by a certain date; ensure clear market expectations; strengthen investor confidence; and provide predictability for future budgeting and continuity for programme design and deployment.

Solar and wind start-ups, many of which take years to become profitable, may not have enough taxable income to take full advantage of credits. Refundable tax credits could be used to reduce a company's tax liability to less than zero, helping them accelerate when clean power projects come online. Such credits have been requested by wind and solar companies and associations, who they believe are essential for ensuring continued growth in 2009 and 2010.

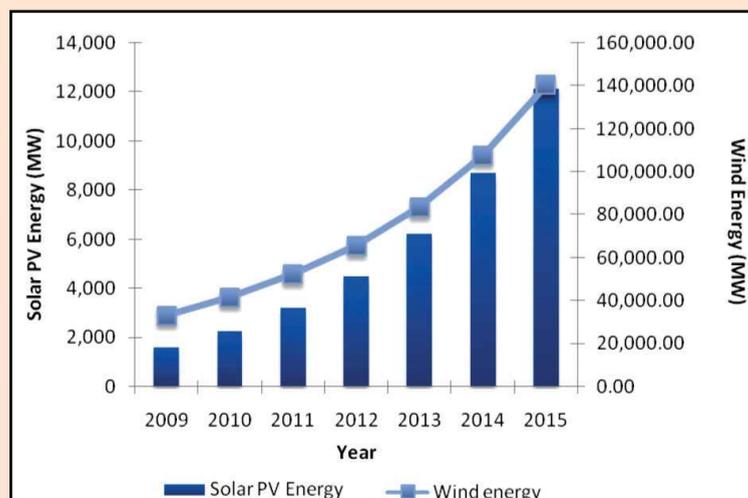
Georgina Benedetti is Research Analyst, Energy and Power Systems Group at Frost & Sullivan. If you would like more information on this subject, contact Chiara Carella, corporate communications. Email: chiara.carella@frost.com



Benedetti says the new administration's plan should evaluate other actions that are considered important by market participants



State RPS policies play a major role in US renewables development: cumulative non-hydro renewable capacity in RPS and non-RPS from 2005 to 2007 reducing the cost of PV modules.



US wind and solar installed capacity forecasts, 2009-2015

Oil

OPEC looks for \$60/barrel average in 2009

■ OPEC sticks with output target
■ Cuts result in oil being moved out of storage

By David Gregory

The price of WTI crude moved above \$50/b in mid-March on the Nymex exchange just before OPEC ministers gathered in Vienna on 15 March to contemplate what, if anything, could be done to improve prices in the face of the global economic downturn.

Despite a considerable amount of speculation prior to the meeting that a further cut in production would be adopted, OPEC decided to stick with its output target of 24.845 million b/d for the 11 members participating in the cut (Iraq is exempt). The group acknowledged that any attempt to raise prices through another production cut could undermine any prospect of an

improvement in demand for crude and that a jump in oil prices as a result of another cut could do more harm to the world economy.

At the 12-member group's conference in Algeria last December, it was decided to cut 4.2 million b/d from its September output. Since then, compliance with the new quotas is estimated at about 80 per cent. Some agencies and news organizations monitoring OPEC output estimate that the group is still producing more than 1 million b/d above the 24.845 million b/d target, but OPEC itself, in the March edition of its *Monthly Oil Market Report (MOMR)*, put February output for the OPEC-11 at 25.715 million b/d, missing the target by

870 000 b/d.

OPEC's predicament stems from the fact that the global economic downturn has destroyed demand for crude oil. The Paris-based International Energy Agency (IEA) and Energy Information Administration (EIA) of the US Department of Energy have both in their recent monthly reports forecast that demand for crude oil will fall by more than 1 million b/d during 2009. OPEC's latest *MOMR* predicted a slide in demand for the year of 1 million b/d.

The economic data released by OECD countries paints a bleak picture for economic activity in 2009, especially for OPEC countries, many of which had come to rely on steadily rising crude oil prices over the last few years. OPEC members Iran and Venezuela are expected to face serious budget problems if crude oil prices remain in their current \$50/b range or lower, but at this point and under these

circumstances reaching \$75/b – the level Saudi Arabia has described as a fair price for a barrel of oil – appears to be a long way off.

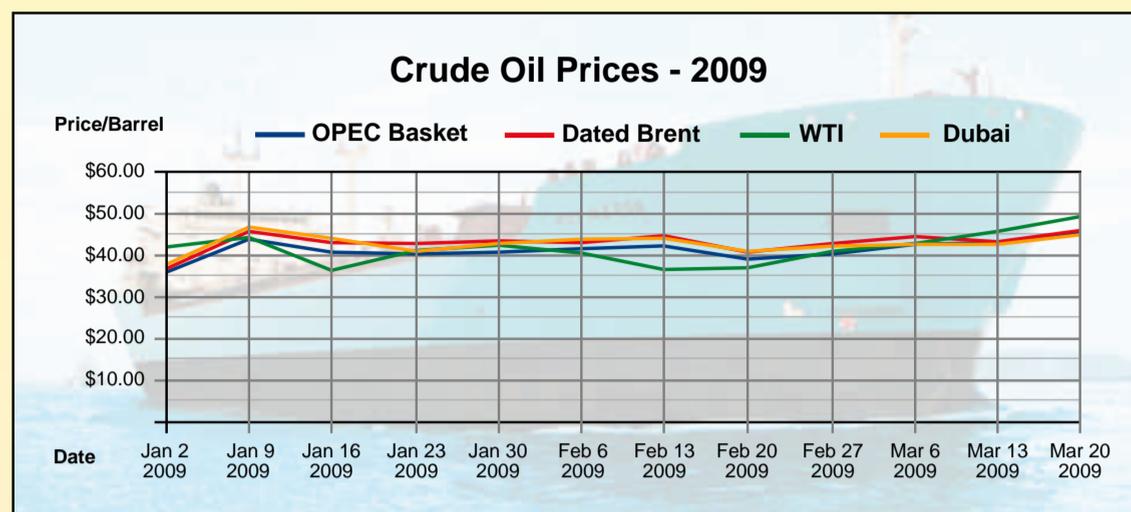
The *MOMR* spoke of a bleak year ahead: "The world economy is in a dreadful situation with GDP sliding into the red for the entire year of 2009," it said. "With recent data releases continuing to be overwhelmingly negative, further downward revisions in growth projections for 2009 are expected. China, the Middle East, and 'Other Asia' were the pillars behind last year's oil demand; however due to the spillover of the economic downturn, these regions are no longer the initiators of high growth to world oil demand."

The recent pickup in crude prices suggests that OPEC's production cut is resulting in some oil being moved out of storage, although stocks in the US, the key market, remain high. Following the OPEC meeting, Saudi

Arabia's Minister of Petroleum and Mineral Resources, Ali Naimi said he believed OPEC had succeeded in stabilizing oil prices and added that he hoped to see "a gradual improvement in prices over time." Algeria's Minister of Energy and Mines, Chakib Khelil, said he expected to see prices reach \$60/b before the end of the year.

OPEC has scheduled its next meeting for 28 May, when it will examine what impact the G-20 meeting in London in early April has had on the global economy and subsequently oil prices. The group will also be better able to tell if members are complying with the new quotas.

Meanwhile, the drop in crude prices has caused a number of crude oil producers to postpone projects designed to boost capacity, and OPEC members are arguing that a minimum price of \$70-75/b must be reached in order for investment in new projects to resume.

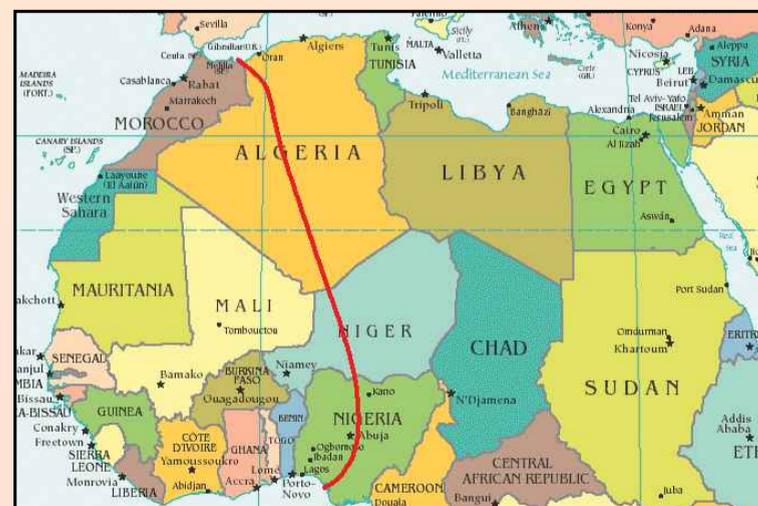


Gas

Trans-Saharan pipeline promising for Europe

Total's interest in a trans-Saharan gas pipeline has caused Europe to once again look at the project as a way of diversifying its sources of gas imports.

By Mark Goetz



The trans-Saharan gas pipeline would stretch across 4200 km

The recent expression of interest by France's Total in the proposed Trans-Saharan Gas Pipeline (TSGP) has prompted European states to think again about the expensive Nigerian-Algerian project and see it as a worthwhile possibility. But the Russian gas monopoly Gazprom's announcement that it too was discussing participation in the project with Nigeria's leaders could dampen Europe's hope that Nigeria could serve as an alternative gas supplier free from Moscow's involvement.

With natural gas reserves estimated at 186 trillion cubic feet, Nigerian gas appears to be an attractive source of supply to Europe – provided a 4200 km pipeline could be built across almost the western entirety of the African continent and maintained and

guarded from terrorist attack.

The idea for a pipeline that would carry Nigeria's natural gas to Europe was launched in 2002 when the Nigerian National Petroleum Corporation (NNPC) and Algeria's state-owned oil and gas company Sonatrach signed a memorandum of understanding (MOU) for the project. Earlier this year, following the completion of a feasibility study, a further agreement was reached by the two state-owned firms to pursue an accord between Nigeria, Niger and Algeria allowing for the construction of the project.

Last month, speaking at the Nigerian Oil and Gas conference in Abuja, the managing director of Total Exploration and Production in Nigeria, Guy Maurice, described the TSGP, also known as the NIGAL pipeline, as a "long-term strategic diversification" for Nigeria, one that Total found interesting and with which it is was ready to become involved.

Gazprom has also said it would like to take part in the TSGP provided the project is commercially viable. Gazprom's managing director in Nigeria, Vladimir Ilyanin, said in early March that his company intends to invest \$2.5 billion in development and production infrastructure in Nigeria's gas sector. Mr. Ilyanin said Gazprom has the scale of experience to make a worthy contribution to the TSGP.

Europe's interest in developing the TSGP is similar to its interest in developing the Nabucco gas pipeline from the Caspian through Turkey – to diversify its growing need for gas imports and reduce its reliance on Russia for gas supplies.

However, a key concern for Europeans about the pipeline is security. Nigerian rebels associated

with the Movement for the Emancipation of the Nigerian Delta (MEND) warned potential investors in the TSGP in late February that the group is determined to sabotage the project from its inception. Tuareg rebels in Niger and groups linked to Al-Qaeda throughout the region also pose a risk.

But it will likely turn out to be a risk that European investors are willing to take despite the threat of attacks upon the infrastructure and possible Russian participation.

The initial cost of the pipeline was put at \$10 billion but this may well be dwarfed by actual cost estimates when and if construction finally begins. Currently the TSGP is scheduled to become operational in 2015 with an initial capacity of 18 billion m³/year (bcm/y), eventually rising to 30 bcm/y.

The pipeline will begin in Nigeria's Warri region and run through the Saharan state of Niger to the gas gathering hub of Hassi R'Mel in central Algeria. From Hassi R'Mel, the Nigerian gas would be shipped to Algeria's gas centres of El Kala and Beni Saf on the Mediterranean coast for further shipment to Europe via the Trans-Mediterranean, Maghreb-Europe, Medgaz and Galsi pipelines. Some of the gas could be routed to Algeria's LNG facilities for export in that form.

However, there is opposition to the project inside Nigeria itself. There is the ongoing controversy within the country that the government is failing to distribute the country's hydrocarbon wealth in a manner that benefits the wider population. That sentiment has given rise to groups like MEND and a growing number of attacks against oil and gas production installations operated by foreign companies.

The biofuel debate

EU and US renewable energy policies call for greater use of biofuels, but concern about their sustainability and costs of production are limiting their production. The need for increased research into alternative feedstocks has never been greater.

Dr Bart Lucarelli and Siân Crampsie

Whether it's rapeseed from Europe, soybean or corn from the US, sugar cane from Brazil or palm oil from southeast Asia, biofuel production has received some bad press in recent years.

In spite of the potential for biofuels to enhance energy security and reduce greenhouse gas emissions, biofuels have come under scrutiny because of their potential adverse environmental impacts. Environmental groups and governments alike are concerned that these impacts could be greater than the environmental benefits derived from using biofuels to replace fossil fuels. In other words, there is growing concern that they are not sustainable.

Biofuels, which are liquid fuels derived from any renewable organic resource, are, in theory, carbon neutral because they absorb as much carbon dioxide when they are grown as when they are burned. The equation becomes less favourable when you take into account the energy used in their harvest, refining and transport. Nevertheless, the fact that they produce fewer carbon emissions when burned compared with conventional fossil fuels has driven a growing "political" appetite for biofuels in Europe and to a lesser extent in the US over most of this decade.

In the European Union, governments have committed to the increased use of biofuels in the transport sector, while US president Barack Obama favours increased R&D into the development of new biofuel feedstocks and advanced technologies for converting biomass into liquid fuels.

But biofuels have lately come in for scathing criticism from environmentalists due to the adverse environmental effects of their large scale production, with questions surrounding their true environmental footprint.

As cases in point, land used normally for food crop production is now being used for biofuel crop production, while forest and peatland are also being destroyed in some areas to make way for plantations. Clearing the land not only releases large amounts of greenhouse gas but can also affect biodiversity, water resources and soils.

The use of existing farmland to produce biofuels has also had an impact on food prices, especially rice, soya and corn. People in poorer countries have already been affected by such increases, according to the World Bank.

Jatropha: claims are unproven or overstated



Promising research? The Shell biofuel research laboratory in Amsterdam, the Netherlands

These concerns led lawmakers in the EU last year to "downgrade" proposed biofuel targets for the transport sector. Instead of mandating that biofuels should account for 10 per cent of energy use in the transport sector by 2020, governments agreed to a diluted target of 10 per cent "green fuel" use, which is defined to include hydrogen and renewable electricity as well as biofuels.

In addition, biofuels used in the EU must offer at least 35 per cent carbon emission savings compared to fossil fuels, a figure that will rise to 60 per cent in 2017. However, environmental groups were disappointed that a clause on indirect land use change (ILUC) was not included in the final legislation. The European Commission is now tasked with coming up with proposals to limit ILUC.

The algae-to-biodiesel approach is an exciting new concept, but has a long way to go before becoming a commercial reality

To overcome the sustainability issues surrounding biofuels, much has been invested in research into advanced biofuels and non-food crops that can be grown on marginal lands. In the case of biodiesel, considerable agronomic research has been completed into improved methods for raising and harvesting jatropha curcas and blue-green freshwater algae.

Jatropha was previously classified as a weed and has been used to reclaim eroded lands and restore vegetative cover on retired mining sites. In its favour is the fact that jatropha curcas is able to grow on marginal soils and in arid climates, which means it need not compete with food crops grown on arable lands. It is also largely resistant to insects and common plant diseases and the seeds and oil are toxic, which means they cannot serve as fodder for animals. In addition, jatropha is a long-lived bush with an economic lifetime of 25-30 years before replanting is required.

Most of the arguments in favour of jatropha, however, are either unproven or overstated. Jatropha is certainly able to grow on marginal soils with little rainfall and fertilizer, but the oil yields would be very low and harvesting and collection costs very high if inadequate amounts of water and fertilization were

provided. In addition, jatropha was not raised commercially until the last two to three years and there is not enough experience to predict its yields per hectare over time or its optimal growing conditions, in particular its water and fertilizer requirements.

At present, yields are about one half of the yields achieved for palm oil, often viewed as a "bad" biofuel because of the destruction of rainforest to make way for palm oil plantations. Companies that are conducting agronomic research into improving the oil yields of jatropha expect to eventually achieve a yield of 2.5-3 tonnes of jatropha oil per hectare, about 30-35 per cent lower than yields achieved from a palm oil plantation.

Achieving such yields will involve intensive management, irrigation and fertilization, albeit at significantly

would then be converted into biodiesel by transesterification, a chemical process used to convert animal fats and vegetable oils into biodiesel.

Companies marketing this technology estimate that properly maintained, closed algae farms can yield 35-50 tonnes of vegetable oil per hectare, which is 10-15 times that of a well-managed palm oil plantation. Moreover, the algae farms should reach maximum oil output by the end of the first year of operation while a palm or jatropha plantation requires 3-5 years before yielding maximum output. The algae cake that remains after lipids extraction is rich in carbohydrates and protein and can be processed further to produce ethanol and a protein-rich animal feed.

The algae-to-biodiesel approach is an exciting new concept, but has a long way to go before becoming a commercial reality. The structures and equipment required for such plantations are currently very expensive with capital costs estimated at between \$200 000 and \$250 000 per hectare, well over 200 times the cost to develop a palm oil plantation.

In addition, no information has been published about operation and maintenance costs for a commercial scale system, capital replacement costs and actual yields of oil from an independent test facility.

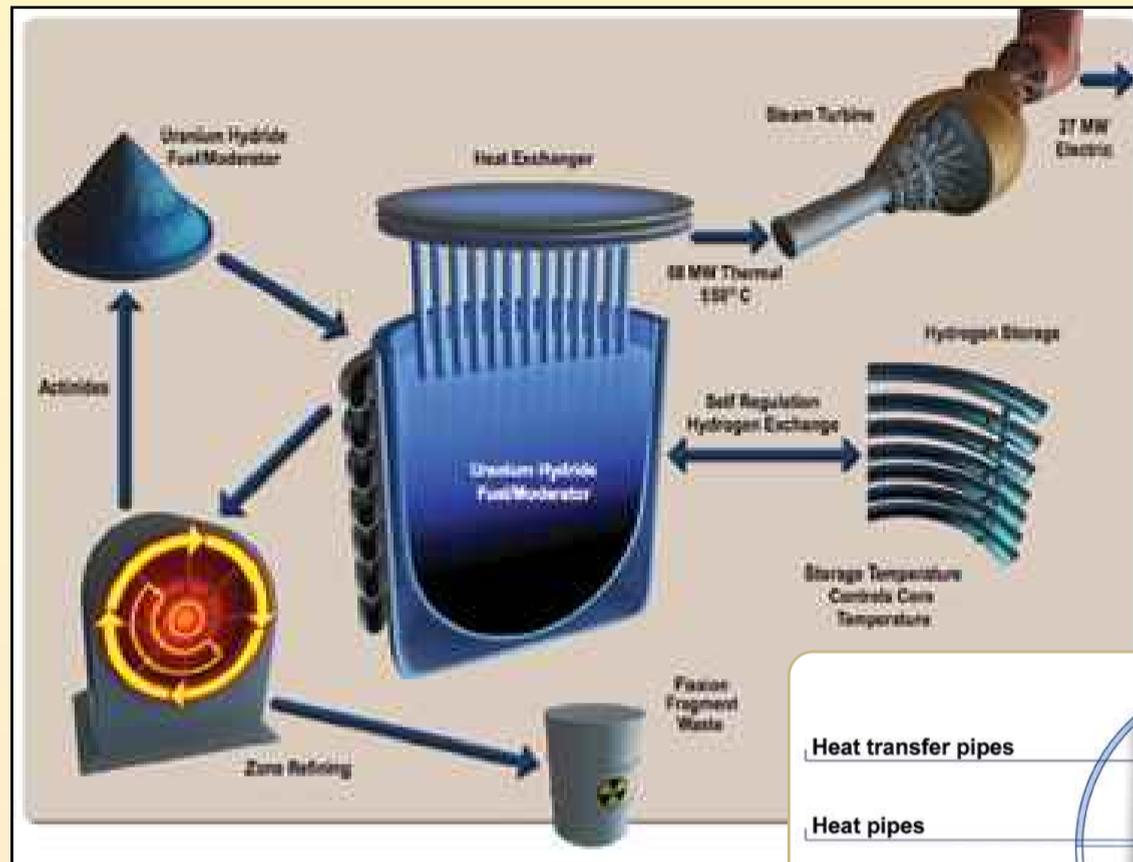
Alternatively, algae can be raised in large, "open raceway" ponds, which are much lower in cost. For tropical climates, these open pond systems are clearly the way to go. However, oil yields for open algae ponds are much more limited, and maintaining consistent yields have proven difficult due to predator micro-organisms and competing algae species invading the open ponds. In some quarters, there is also concern that large, mono-culture algae ponds might lead to adverse ecological impacts.

Before biodiesel, and other bio-fuels, can be declared sustainable options for reducing dependence on fossil fuels and emissions of greenhouse gases, major technological breakthroughs are needed in the areas of alternative feedstocks and advanced technologies for converting biomass into liquid fuels.

Dr Bart Lucarelli is president of LP Power Consultants, Ltd. based in Thailand.

Nuclear goes portable

For most, 'NIMBY' means: 'not in my backyard'. But it may not be long before it is understood to mean 'nuclear in my backyard' – almost literally. US company, Hyperion Power Generation is commercialising a small mobile, modular reactor. Measuring just 1.5 m x 2 m, it could provide a new alternative to current forms of distributed generation, **writes Junior Isles**



Hyperion Power Module – fuel, energy power cycle (the illustration at the bottom right shows the reactor core and its relative size)

In as little as five years, the advantages of nuclear power – but without the high cost and long lead times – could be available for remote locations. US company, Hyperion Power Generation, is commercialising a small, self-contained, self-regulating reactor specifically for applications in remote areas where cost, safety and security are a concern.

The Hyperion Power Module (HPM), conceived at Los Alamos National Laboratory in the US and licensed to Hyperion for commercialisation, will generate 70 MWth of heat or 27 MWe of electricity, depending on the application.

Commenting on the technology, John "Grizz" Deal, CEO of Hyperion Power Generation said: "The idea behind the reactor is fairly simple. If you maintain criticality with the right kind of fuel, you can generate heat. Nuclear is about how you control that heat and what you do with it. Large commercial reactors are specifically designed to produce electricity; the idea behind the HPM from the beginning was to generate heat. It's then up to the user what they want to do with that heat. It could be for generating electricity, district heating etc. We basically see it as a kind of thermal battery."

The reactor has a 1.5 m core without any mechanical intrusions. This allows it to be sealed at the factory, sited underground and eventually returned to the factory for fuel recycling and refuelling.

A key feature of the reactor is the use of uranium hydride for fuel. The hydrogen in the fuel moderates the release of neutrons during the fission reaction and so there is no need for control rods. The reaction is self-regulating and therefore inherently safe. Deal explained: "By controlling the temperature, we control the set point and create a

natural equilibrium. If it gets too hot, the hydrogen is thrown and off and if it cools down, the hydrogen is naturally attracted back to the uranium. It is impossible for it to go supercritical or meltdown."

The absence of moving parts reduces the complexity of the system. The pipes for heat extraction act as the cooling system. The reactor operates at an optimum temperature of 550°C, picked as the goal for the US Department of Energy's Generation IV reactors. Heat is output at about 530°C. The amount of heat extracted determines

Speed of construction and costs are important selling points for the HPM. At about \$30 million per unit, capital costs are about \$1200-1300/kW

the useful lifecycle of the fuel but it is estimated at five to seven years.

Hyperion has identified three main markets for the HPM. The first is for remote distributed power production. "That could be Arizona but it's more likely to be in the remote areas of Alaska, developing countries in Africa and Asia. You could power about 25 000 US-style homes with one of these reactors," noted Deal.

The second market is for retrofits in, for example, eastern Europe. The case for units in this market was highlighted by the recent problems caused by the difficulties some countries faced during the gas dispute between Russia and Ukraine earlier this year. Deal said: "There is probably a market for about 100 of our reactors in just Slovakia and the Czech Republic alone. They have dozens of old plants that will be in need of retrofitting. They have pressure from CO₂ emissions and the cost of natural gas. Natural gas is around \$/8 million Btu; our costs are about \$3/million Btu. There is

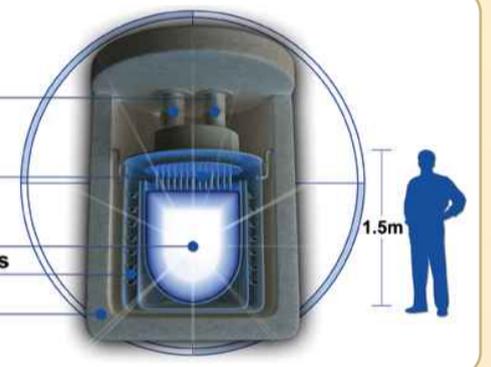
Heat transfer pipes

Heat pipes

Uranium hydride fuel/moderator

Hydrogen storage trays

Containment



of the reactor design, selecting materials, and optimising the fuel cycle.

The main challenge has been with the heat extraction system. Deal noted: "Extracting energy in a repeatable way affects the fission process inside the core. We need to understand things like: what happens if there is embrittlement causing heat pipes to break? We don't have the same complexity as large conventional nuclear power plants but we have some of the same issues in terms of materials science."

All of this is working towards the goal of making an application to the US Nuclear Regulator Commission (NRC) in about two years to request design certification. NRC certification will allow potential owners to seek an operating licence, essentially overcoming part of the regulatory challenges ahead of time. "It's not a case of *if* it will be certified but *when*."

a lot of interest from this part of the world even though we are about four and a half years away from introduction."

Hyperion also sees another market in the recovery of heavy oil from oil sands. "This is an energy intensive process for which, ideally, they would like to buy just heat from us. There are big markets for this application in Canada, the US and

US-based energy technology investment company, Altira, is providing capital to bring the HPM to market. Deal said: "We are refining the design and it will be certified. Altira has been great in working with us to help us keep going. We are always looking for more financing but we will get to market for less than \$100 million, which is a drop in the bucket for an energy project. It helps to be able to leverage intellectual property facilities through the technology transfer programme with Los Alamos."

The HPMS will have to be assembled near uranium enrichment facilities. A manufacturing factory will therefore be set up in the US and joint ventures will be formed with nuclear services companies to build other factories around the world. Commenting on the production numbers, Deal said: "The market for a reactor of this size today is about 70 000 reactors and we expect to turn out a couple thousand of the first design over the first 10-15 years. The constraint will be regulatory issues, not how many we can build."

Hyperion says it has already received commitments for 10 HPMS and hopes to introduce the first reactor by around 2014. While it is not yet known where this reactor will be, it is expected to be at a military installation where there is a need for secure, reliable power.

Deal concluded: "People are now looking for lots of different answers. In a recent poll in the US, 83 per cent said they thought nuclear would become much bigger in the US in the next 10 years. It's not that they want it; it's that they expect it. There's not much choice."

Latin America." Deal adds that designing the unit to produce heat offers its potential users greater flexibility.

The HPM, weighing less than 25 t, will be installed a few metres underground in a concrete vault measuring 10 m x 10 m. According to Hyperion, a unit can be installed in just a couple of days. "We are already doing site planning with a few customers who are looking at 18 months for a new plant, including construction of the boiler, turbine installation etc. The last two weeks of construction is for installation of our unit. With regards to the HPMS, the time will be in the customers gaining regulatory approval."

Speed of construction and costs are important selling points for the HPM. At about \$30 million per unit, capital costs are about \$1200-1300/kW. "We have to get past the idea that nuclear plants cost billions of dollars and take 15 years to build," commented Deal.

Hyperion is currently making decisions on the detailed features



Junior Isles

Choose your words carefully

'Marketing moguls', or should we say 'specialists of spin', have a lot to answer for. Although few could be accused of outright lying, it's fairly safe to say that most are guilty of often stretching the truth, or at least making statements with little supporting evidence.

Unfortunately, confusing the general public on technical energy issues is not too difficult, and it is something that many in the power and energy business have been only too willing to exploit.

There was an interesting piece of news from the US just last month where power generator, Entergy, was forced to retract claims of "zero emissions". Last year, the Vermont Public Interest Research Group complained about a statement made by Entergy that said the Yankee nuclear power plant emits zero emissions. After investigating the claim, Vermont attorney general William H. Sorrell ruled that the statement was inaccurate.

"Experts agree that while greenhouse gas emissions from the nuclear generation of electricity are negligible, such emissions – a major cause of global warming – do occur when uranium, the fuel used in nuclear reactors, is mined, processed and transported," wrote Sorrell. "Applying a life cycle analysis, nuclear power lies toward the lower end of the emissions continuum, but well above zero."

Sorrell urged all stakeholders in the discussion of global climate change to be "clear, accurate and transparent in their statements about carbon emissions".

Entergy, which owns and operates the Yankee power plant in Vernon, has since acknowledged to the attorney general that its zero emissions claims were inaccurate and promised not to use them again without a clear and accurate explanation of exactly what they mean.

Rob Williams, spokesman for Yankee commented: "The ad wording was obviously unfortunate and we will strive to present clear, fact-based comparisons in future communications."

In a press release announcing its agreement with Entergy, Sorrell wrote: "Global warming is a critical issue. The public needs good information in order to make decisions about how

best to address this environmental challenge.

"I am pleased that Entergy has agreed to do so in its future communications. All participants in the public debate on climate change policy should ensure that factual statements about carbon emissions clearly and truthfully specify what the emissions claims refer to."

This case may have ended on a happy note but unfortunately it is just one example of an issue that is becoming endemic in our industry.

How often have we seen marketing slogans such as "Black is the new Green" referring to cleaner coal projects or worse still, electricity companies selling "green tariffs" and businesses making claims to be "carbon neutral" in an attempt to win customers by increasing environmental kudos?

Since marketers clearly have no problem in making inaccurate statements regarding the environment, it is good to see that advertising watchdogs and regulators are now paying more attention to the issue.

In February, UK energy regulator Ofgem published a final set of revised guidelines on how suppliers should

changes will expand the environmental and social responsibility sections of the code to "prevent marketers from exaggerating the environmental benefits of their products".

With 'greenwashing' evident at every turn, it is time that the public is offered some level of protection or at least explanation. At the end of February the UK government announced new policies designed to help provide clarity and confidence for consumers concerned about climate change. The Department for Energy and Climate Change (DECC) launched a new carbon offsetting quality mark and also announced a consultation on a clear definition of the term "carbon neutral".

To help consumers easily identify carbon offsetting projects that offer genuine carbon savings, the government has developed the Carbon Offsetting Quality Assurance Scheme.

Minister for Energy and Climate Change, Joan Ruddock, welcomed the development of the offsetting quality mark saying: "Information for consumers needs to be crystal clear and people need to have confidence that their money is put to good use.

the use of the term 'carbon neutral' is perhaps more interesting than carbon offsetting quality assurance schemes.

Ruddock noted: "The UK will need to live within set carbon budgets as we reduce our emissions by 80 per cent by 2050. This will be nothing short of a revolution in the way we live and we need to ensure that terms like 'carbon neutral' are not used carelessly but are clear measures of what we can and will achieve."

The consultation recognises that the phrase "carbon neutral" is in common use, but claims about being carbon neutral can be unfounded. The clarification process is designed to ensure businesses and consumers can be confident about the positive decisions they make to take meaningful action in the fight against climate change.

The "Carbon Neutral" consultation proposes the following definition: Carbon neutral means that – through a transparent process of measuring emissions, reducing those emissions and offsetting any unavoidable emissions – net calculated carbon emissions equal zero.

It sounds like a fair proposal for a definition (the government is inviting responses to be sent to carbonneutrality@decc.gsi.gov.uk by May 21, 2009) but it will be no solution to the problem. While the government believes that establishing a single definition of carbon neutral would help standardise the term – "enabling individuals, groups and organisations to take informed decisions on its application" – it does not intend to regulate the use of the term.

Further, we operate in a global business and one country's idea of carbon neutral or green may be different to another's. Advertising standards also vary.

Certainly, language is a living thing and evolves with time; there may come a time when "black" is indeed "the new green" but facts tend to remain the same.

And so, it is up to us to regulate our use of terms as they relate to technology and come to a common, enduring understanding of those terms. As a defender of the written word, I will play my small part in unravelling the spin of the marketing moguls by preserving truth, technical accuracy and maintaining clarity whenever possible.

The consultation recognises that... claims about being carbon neutral can be unfounded

market green electricity tariffs to make it clear to customers whether these tariffs are truly 'green'. The guidelines will form the basis of an independent accreditation scheme for green tariffs. The aim is "to help reduce customer confusion and rebuild their trust".

Under the scheme, a tariff will only be regarded as green if it brings additional environmental benefits beyond the suppliers' existing government environmental obligations. The big six UK suppliers and Good Energy have signed up to the guidelines and Ofgem will work with these suppliers to set up the accreditation scheme by this summer.

But even under such a scheme, suppliers could reasonably argue that many of today's modern thermal plants could be classed as 'green'.

Just a few weeks ago in the UK, the Committee of Advertising Practice began a clampdown on 'greenwashing' as part of a consultation into the broadcast advertising code's first big changes in eight years. The proposed

This new quality mark – developed with the industry – aims to improve transparency and give confidence to people wanting to offset their travel. "Everyone should look for opportunities to reduce their emissions. Where we can't avoid emissions, offsetting offers a means of taking responsibility for them," said Ruddock.

Carbon offsetting is a way of compensating for unavoidable carbon emissions by making an equivalent carbon dioxide saving elsewhere.

Offsetting companies using the quality mark on their products will need to have registered with the Carbon Offsetting Quality Assurance Scheme, and will have demonstrated that their projects are compliant with Kyoto standards to offer genuine, additional, measurable carbon savings, thus bringing consistency and transparency to the market place.

As a wordsmith within the power and energy community, the consultation proposing improved stringency and greater consistency in



"Are you serious...?!"