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THE ENERGY INDUSTRY TIMES

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China looks to expand overseas as it tops clean energy investment table


On top of the world: Yunnan, China's highest wind farm

China, which recently topped the table of G20 countries for clean energy investment, is now making inroads to international wind energy markets, **writes Junior Isles**

China, which overtook Germany last year to become the world's second largest producer of wind power behind the United States, is now investing in wind energy markets abroad.

The Chinese Development Bank recently said it will financially support companies in the People's Republic of China to invest in the Romanian wind power sector.

China's General Consul in Constanta, Wang Tieshan said their projects are currently at the feasibility study phase. "We want to jointly develop projects with Romania and in Tulcea, why not."

Tulcea (eastern Romania) is among the counties considered to have the highest potential for wind power. Both Romanian and foreign companies are in the process of submitting applications in order to carry out 70 wind farms with 1703 wind turbines.

China is hoping to capitalise on its own aggressive wind programme, which has seen the installation of 25.8 GW of wind capacity – second only to the US, which has an installed wind capacity of 35 GW. The Global Wind Energy Council, which represents companies that make and manage wind power stations, said it expects China to eventually overtake the US and exceed its own target of 150 GW by 2020.

China is the world's biggest emitter of greenhouse gases, but is turning to renewable energy to reduce emissions.

According to a recent report by The Pew Charitable Trusts, China invested $34.6 billion in clean energy in 2009, making it the world leader in clean energy investments. The Pew report said China topped the Group of 20

Continued on page 2

France closes in on Italian nuclear market

Following the setback to its nuclear ambitions when Abu Dhabi opted for South Korean technology for four new reactors, France is positioning itself as Italy's main nuclear partner.

French president, Nicolas Sarkozy and Italy's prime minister Silvio Berlusconi presided over an extension of Franco-Italian nuclear co-operation at their bilateral summit in Paris last month.

The summit saw EDF, Enel and Ansaldo Energia, a subsidiary of Finmeccanica, sign a memorandum for the development of nuclear power in Italy.

The aim of the memorandum is to enhance the role of Italian industry in the construction of the new nuclear power plants planned in Italy. The cooperation agreement could be extended to international Evolutionary Pressurised Reactor (EPR) projects.

The objective of the agreement is to specify areas of potential cooperation between Enel-EDF and Ansaldo Energia which holds 100 per cent of Ansaldo Nucleare in the development and construction of at least four EPRs that Enel and EDF, with Areva technology, intend to build in Italy, EDF said.

In addition, Ansaldo Energia will participate in the qualification and tender process carried out by Enel and EDF for the supply of equipment, installation and engineering systems (packages). The agreement, which has a minimum duration of five years, leverages the existing expertise of Ansaldo Energia in the nuclear power sector and sets out the scope for the future development of the company in this area, along with the construction of the Enel and EDF plants in Italy, the company added.

As envisaged in the agreement, Finmeccanica has reportedly undertaken to support Ansaldo Energia in the qualification process and in developing the activities with the necessary investments in terms of production lines and human resources.

Enel is a shareholder in France's new generation European pressurised reactor project, while it and EDF, the state-owned utility that manages the country's 58 nuclear reactors, have a joint venture to build reactors in Italy.

French officials said today's agreements would build on that co-operation. Seven agreements would be signed, covering the manufacturing and supply of nuclear components, joint bids in new markets, training and waste disposal.

Areva, France's nuclear engineering group, will sign an accord with Ansaldo Nucleare, the nuclear components arm of Italy's Finmeccanica, that will give the Italian company access to France's EPR technology.

Ansaldo is to become a key supplier to the joint venture between EDF and Enel. People close to the companies said Ansaldo would bring expertise in the certification process, critical to the construction of any reactor.

Italy banned nuclear power in 1987 after the Chernobyl disaster, but pushed through a decree that sets a timetable for work to start on new reactors from 2013, with production due to come on line by 2020. Mr Berlusconi has said he wants 25 per cent of Italy's electricity to be generated by nuclear reactors.

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(Continued from page 1)

(G-20) major economies, with nearly double the US total of $18.6 billion.

Although increasing its generation from renewables, China will continue to depend on coal fired power plants and is beginning to take steps in the development of cleaner coal technology.

Marking a critical step toward the deployment of cleaner coal technology in China, GE and China Power Engineering Consulting Group Corporation (CPECC) recently signed agreements with the US Trade and Development Agency (USTDA).

Under the terms of the agreements, USTDA will fund a feasibility study that would support the advancement of commercial scale integrated gasification combined cycle (IGCC) facilities in China based on GE-designed IGCC technology. In this initial study phase, GE and CPECC will evaluate the cost and performance of an IGCC design.

"Coal is an abundant and low cost resource in China and the US gasification technology allows us to use it in a much cleaner way," said Steve Bolze, president and CEO for GE Power and Water. "To achieve significant reductions in carbon dioxide and other emissions, cleaner coal power generation technologies such as IGCC must be part of the solution; GE is pleased to be working with CPECC and USTDA in this important endeavour."

Last month Chinese Premier Wen Jiabao also held talks with Danish Prime Minister Lars Loekke Rasmussen in Beijing, during which the two countries agreed to further improve their trade ties and enhance coordination on climate change.

Premier Wen spoke highly of the efforts Denmark had made for the convening of the UN climate change conference in Copenhagen last December, which ended with the Copenhagen Accord.

He reaffirmed China will strive to meet its greenhouse gas emission cut target in the interest of China itself and the world. The country announced in November last year that it aimed to reduce the intensity of carbon dioxide emissions per unit of GDP in 2020 by 40 to 45 per cent compared with 2005 levels.

Rasmussen expressed his thanks for the important role China had played in helping to reach the Copenhagen accord, and spoke highly of China's positive efforts in energy conservation and emissions reduction.

Dealing with climate change is an important field of cooperation between Denmark and China, as well as between the European Union and China, said Rasmussen. He said he expects to enhance communication and coordination with China on this issue.

Denmark took the opportunity of the 60th anniversary of bilateral ties to expand cooperation in areas like trade, clean energy, bio-pharmaceutical and science and technology research. Denmark was one of the first Western countries to recognize and establish diplomatic relations with the People's Republic of China. The two countries forged diplomatic ties in May 1950.

Americas unite to promote clean energy future


US Secretary of Energy Steven Chu announced new projects

The US is hoping that expanding cooperation on key energy and climate issues will lay the foundation for economic growth while helping to protect the environment, **writes Junior Isles**

The US is expanding its cooperation and collaboration with dozens of countries in the Americas on key energy and climate issues in an effort to protect the environment while setting a solid base for regional economic growth.

Energy ministers and delegations from 32 countries met last month at the Inter-American Development Bank (IDB) in Washington, DC for the Energy and Climate Ministerial of the Americas. Energy officials joined with more than 200 businesses and non-governmental organisations to advance initiatives under the Energy and Climate Partnership of the Americas (ECPA).

ECPA was launched last year during the Fifth Summit of the Americas, when US President Barack Obama and western hemisphere leaders committed to expand energy and climate cooperation as part of a joint effort to ensure economic growth and prosperity by developing clean energy resources, increasing energy security and reducing energy poverty. ECPA is part of an innovative approach to regional partnerships that includes the involvement of the private sector and aims to maximise each country's unique strengths and resources to find new ways to produce and use energy.

At the Washington meeting the US Department of Energy announced a series of partnerships and other initiatives to address clean energy and energy security in the western hemisphere as part of the ECPA. US Secretary of Energy Steven Chu announced new projects focused on clean energy cooperation, technical assistance and financing, renewable energy, and electricity infrastructure and earthquake preparedness.

The projects include efforts to advance electricity interconnections in the Caribbean, support biomass development in Colombia, promote earthquake-resistant energy infrastructure, and create an Energy Innovation Centre at the IDB to expand project development and financing.

The Caribbean Electrical Grid Interconnection project will explore the potential for a Caribbean-wide transmission system that would provide the region with access to electricity from renewable energy sources.

The Energy Innovation Centre will serve as a focal point for project development and financing in the region and will be able to access the IDB's annual energy financing pipeline of approximately $3 billion.

The Developing Biomass Resources in Colombia project will partner DOE and National Laboratory experts with scientists and technology experts in Colombia that are involved in on-going research to generate power from sugarcane and palm oil.

Saudi Arabia starts on nuclear path as economy expands

Saudi Arabia is pushing forward its economic expansion with plans to set up a civil nuclear and renewable energy centre to help meet demand for power. According to reports from the Saudi press agency, the King Abdullah Centre for Nuclear and Renewable Energy will be based in Riyadh.

Saudi Arabia possesses a quarter of the world's oil reserves but officials are alarmed at rising domestic oil and gas consumption. The Kingdom uses 1.25 million barrels of oil a day according to the Ministry of Water and Electricity but domestic and global demand has prompted plans to spend $80 billion on power generation and transmission over the next eight years.

Nuclear will be part of the strategy to power energy demand. Saudi Arabia joins Kuwait, Egypt, Qatar and the United Arab Emirates, which are all seeking to develop nuclear energy for civilian use.

France recently signed a civil nuclear cooperation deal with Kuwait and is also negotiating a similar deal with Saudi Arabia.

In a separate announcement, the Shaw Group Inc. said it had signed a multi-phase contract with Saudi Electricity Company (SEC). Under the contract, Shaw will perform a three-phase study to define and recommend operational improvements at 53 power plants throughout the Kingdom.

US power prices plummet in 2009

- Wholesale prices fall by 50 per cent
- Power prices higher in deregulated states

Wholesale prices for natural gas and electricity in all areas of the USA plummeted by about 50 per cent from 2008 to 2009, the Federal Energy Regulatory Commission said in its 2009 'State of the Markets Report'. Declines were similar in both regional transmission organisations and non-RTO regions.

However, retail prices dropped only marginally, FERC staff said.

An updated study by the American Public Power Association (APPA) found that retail electricity prices continue to be significantly higher in states with deregulated electricity markets than in regulated states. According to Energy Information Administration data, the gap between deregulated states and the rates in regulated states widened in 2009. On average, rates in deregulated states are 4.4 cents per kWh above rates in regulated states, the study found.

APPA senior vice president for government relations Joe Nipper said: "We've heard claims that the price drops show how well 'competitive forces' are working in the centralised markets run by regional transmission organisations – but wholesale prices are down by the same amount in every region of the country, not just in RTOs. And, as FERC staff pointed out, those 'competitive forces' aren't helping consumers."

Demand for electricity dropped by 4.2 per cent in 2009, largely due to a sharp decline in the industrial sector, FERC said. "This was the greatest decline in a single year in at least 60 years and, with 2008, the only time electricity demand has fallen in consecutive years since 1949," the Commission said.

The majority of the drop in wholesale electricity prices is attributable to the drastic declines in fuel prices, FERC said. In addition to lower natural gas prices, spot coal prices declined by over 40 per cent in the east and No.2 fuel oil was down 42 per cent in New York. The recession had an effect apart from the decline in fuel prices, the report said, noting that fuel-adjusted prices in PJM fell 10 per cent from 2008 as a result of lower demand.

About 25 GW of new generating capacity was put into service in 2009, the report said. For the second consecutive year, gas and wind led the additions, accounting for 84 per cent of new capacity.

World Bank urges Asian countries on clean energy

East Asia needs new investment of $180 billion a year in clean energy technology to stabilise its greenhouse gas emissions from 2025, the World Bank said in a report.

'Winds of Change: East Asia's Sustainable Energy Future', which focused on China and five Southeast Asian countries – Indonesia, Malaysia, the Philippines, Thailand and Vietnam – urged the governments to take immediate action to switch to clean energy and proposed a "sustainable energy development path" for them to convert to renewable energy.

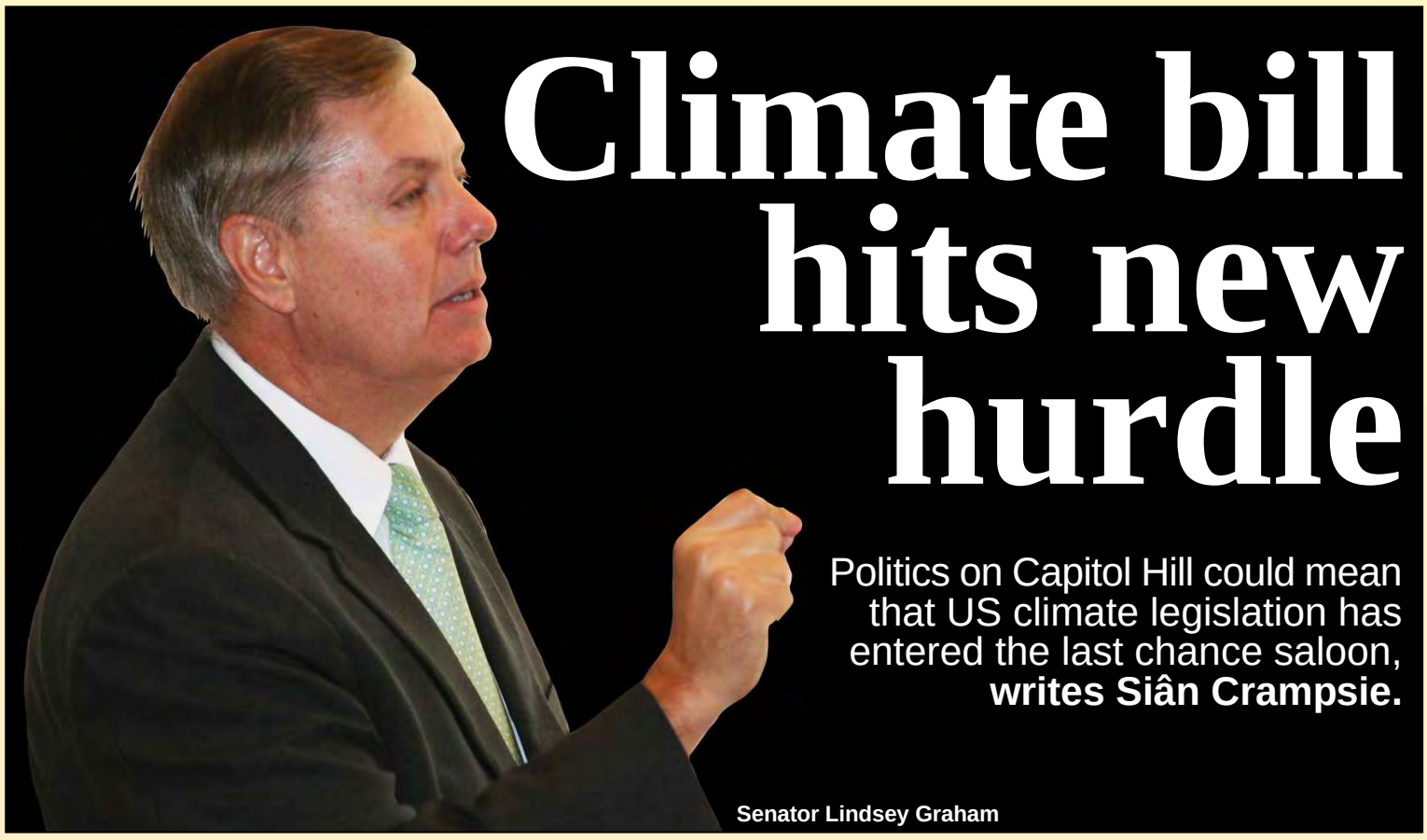
The report says that low-carbon generation such as renewable and nuclear should meet half the power demand in the region by 2030. For that to be achieved, their share in the generation mix will have to increase threefold from 17 per cent now.

The switch to clean energy is likely to take the form of hydropower, wind and biomass in China; hydropower, biomass and geothermal in Indonesia; geothermal and hydropower in the Philippines; imported hydropower and biomass in Thailand; and hydropower in Vietnam.

Nuclear power is likely to feature in China and it noted the governments of Malaysia, Thailand and Vietnam plan to introduce nuclear power after 2020.

The report said international cooperation would be required to mobilise substantial financing for the conversion to clean energy.

It also projected energy consumption in the region could double in the next two decades due to a 50 per cent increase in the urban population.



Climate bill hits new hurdle

Politics on Capitol Hill could mean that US climate legislation has entered the last chance saloon, **writes Siân Crampsie.**

Senator Lindsey Graham

The chances of climate legislation being passed by the US Congress this year look increasingly slim after a key Republican lawmaker pulled his support for a bipartisan energy and climate bill.

Senator Lindsey Graham (R-S.C.) has abandoned the bill that he created alongside senators John Kerry (D-Mass) and Joseph Lieberman (I-Conn) in protest at a decision by Senate majority leader Harry Reid to prioritise an immigration bill.

The bipartisan energy and climate bill is designed to overcome the political stalemate that surrounds climate legislation in the US Senate. President Barack Obama has indicated his support for the bill and has continued to urge lawmakers to get climate legislation passed this year.

The new bill was due to be revealed in late April but Kerry said that the immigration issue would force a temporary postponement. "For more than six months, Lindsey Graham, Joe Lieberman, and I have been meeting for hours each day to find a bipartisan path forward and build an unprecedented coalition of stakeholders to pass a comprehensive climate and energy bill this year," said Kerry.

"We all believe that this year is our best and perhaps last chance for Congress to pass a comprehensive approach."

Obama's administration wants climate legislation to be passed this year in order to help boost energy sector investments and lend weight to the USA's position in the ongoing international climate talks.

The new bill takes a sector-by-sector approach to the control of carbon emissions instead of a cap-and-trade approach such as that contained in the legislation passed by the House of Representatives last year. It is hoped that this will help the bill to gain the support of the oil sector, which has raised concerns about the impact of cap-and-trade on the industry.

In spite of the setback, Kerry and Lieberman say that they remain committed to the bill. "I … am excited about what passage of the bill will do to promote energy security and invigorate our economy," said Lieberman. "I will not give up and will continue to work with Senator Kerry, Senator Graham, and the broad coalition of industry and environmental support this bill has generated to pass the American Power Act this year."

Their proposed bill would apply different carbon controls to different sectors of the economy, with the overall aim of cutting greenhouse gases by 17 per cent below 2005 levels by 2020. It is also likely to expand domestic production of oil, natural gas and nuclear power.

Ontario pushes green growth

The Canadian province of Ontario has taken a major step forward in its climate change programme by awarding contract offers for almost 2500 MW of renewable energy.

The Ontario government has awarded contract offers to 184 projects under the province's landmark Feed-in-Tariff (FIT) regime. The move is part of plans to eliminate the use of coal-fired generation in Ontario by 2014.

The province is also aiming to become North America's leader in green jobs and manufacturing.

"These projects are the latest accomplishments of the Green Energy Act which is making Ontario a place of destination for green energy development, manufacturing, and expertise," said Ontario's Minister of Energy and Infrastructure, Brad Duguid. "The investments generated by FIT will not only create green jobs, but will also build a coal-free legacy for future generations."

Seventy-six of the approved projects are ground-mounted solar photovoltaic, 47 are onshore wind and 46 are waterpower projects. There are also seven biogas, two biomass, four landfill gas, one roof top solar and one offshore wind project.

"Ontario's pioneering Green Energy Act is now taking shape," said Dr. Ingo Stuckmann, President and CEO of Wind Works, which was awarded seven power purchase agreements for a total of 80 MW of capacity. "The announced FIT contracts push the door wide open for the 50 000 new green energy jobs Ontario wants to attract for the emerging North American wind energy market."

Transmission capacity in Ontario will be expanded to accommodate the projects, says the Ontario government.

Chesf consortium wins Belo Monte auction

An $11 billion hydropower project in the Brazilian Amazon looks set to go ahead in spite of fierce opposition by environmentalists and indigenous groups.

The 11 GW Belo Monte dam is an important element of Brazil's Accelerated Growth Programme (PAC) and will be the third largest hydropower plant in the world when complete. The license to build the project was last month awarded to a consortium of Brazilian companies led by Companhia Hidro Eletrica do Sao Francisco (Chesf), the state-controlled generator.

The auction for the license was marked by protests throughout Brazil and was halted at least twice by legal injunctions, according to pressure group International Rivers. Environmentalists and indigenous groups say Belo Monte would devastate wildlife and the livelihoods of 40 000 people who live in the area to be flooded.

The Chesf-led consortium won the auction with a bid of BR77.97/MWh ($57.12/MWh). Chesf's partners in the project are Bertin, Queiroz Galvão, J Malucelli, Mendes Júnior, Serveng and Cetenco.

The Brazilian government dismisses claims that the project will have a negative impact on the environment or local community. The dam will be built on the Xingu River in Para state.

Wind sector calls for grid reform

- Level playing field needed
- Market decline predicted

The US electric industry could look to European models to better accommodate the increasing levels of wind and solar power in the grid, says the American Wind Energy Association (AWEA).

In a filing with the Federal Energy Regulatory Commission (FERC), AWEA has called for updates to be made to the USA's electric utility system to help the integration of renewable energy and to make it more efficient.

The group's proposed reforms would result in reduced bills for consumers as well as improved reliability, it says. They include implementing market structures that promote a level playing field for renewable energy resources in the market and that make the integration of renewables less expensive.

In its filing AWEA says that the rapid level of growth seen in the renewable energy industry in recent years will not continue "if the barriers to further integration of significant numbers of renewable energy resources are not addressed". NERC figures suggest that 145 000 MW of wind capacity is proposed to be added to the grid over the next decade, says AWEA, which has sourced the ideas for many of its proposed reforms from European countries.

Some 10 000 MW of wind capacity was installed in the USA in 2009, placing wind neck-and-neck with natural gas as the leading source of new generating capacity. The number of wind power projects coming on-line in 2010 is expected to drop, however, according to Emerging Energy Research.

Figures from the US-based research firm forecast an 18 per cent dip in new wind capacity to 8000 MW this year, mainly due to a drop in power demand, an expected fall in wind turbine prices and uncertainty over federal policy.

Venezuela turns to Russia and China

Venezuela could enlist the help of Russia and China to develop a civil nuclear industry and tap major oil deposits in the east of the country.

The country's President, Hugo Chavez, has signed agreements with China covering the development of its energy industry, and has also held talks with Russia over the development of a nuclear power plant.

China has agreed to set up an oil exploitation and processing joint venture with Venezuela in the Orinoco reserves belt, and will also help the country to build a new thermal power plant to help ease Venezuela's electricity crisis.

Following a visit to Venezuela by Russian Prime Minister Vladimir Putin, Chavez said that Russia had agreed to help Venezuela draw up plans for a nuclear power plant. The two countries have also launched a joint venture to tap oil reserves in Venezuela.

A prolonged drought in Venezuela, which is dependent on hydropower for its electricity production, has resulted in severe power shortages. Earlier this year the government enacted emergency measures to ease the shortages, including a requirement on businesses and industries to reduce electricity consumption by 20 per cent.

Blow for Australia climate plan

Australia seems to be slowing its efforts to tackle climate change in the face of public and political pressure, **says Junior Isles**

Australia's decision to shelve plans for an emissions trading scheme (ETS) may represent growing public scepticism towards climate change. The ETS was seen as the centrepiece of the government's effort to address climate change.

The move to put the ETS on hold until 2013 comes after the scheme was rejected twice by the Senate, where Prime Minister Kevin Rudd's government does not have a majority. The scheme had been scheduled to begin in July 2011, but Mr Rudd said the government would now delay plans until the Kyoto Protocol expires in 2012.

Australia has some of the highest per capita emissions of developed nations and Rudd had hoped the Carbon Pollution Reduction Scheme (CPRS) would cut the country's carbon emissions by up to 25 per cent from 2000 levels by 2020.

He had hoped to enact the CPRS into law before last year's Copenhagen climate summit but the proposed scheme was rejected by the Senate for a second time shortly before the start of the summit.

Rudd came to power promising tough climate action, and looked set to win this year's Australian election on the emissions trading issue but recent polls have pointed to an erosion of public support.

Some lawmakers questioned the scientific case for global warming and said that the emissions trading scheme would damage Australia's economy.

The decision to shelve the plan came after the opposition Liberal party ousted its leader Malcolm Turnbull, who had pledged his backing for the measure, and replaced him with climate sceptic Tony Abbott.

Abbott told *ABC News*: "It seems the government has dropped its policy to deal with climate change because it is frightened the public thinks that this really is just a great big new tax on everything."

Rudd said the Liberal Party's decision to "back-flip on its historical commitment to bring in a CPRS", coupled with a lack of global action on climate change, meant it was inevitable that the scheme would be delayed in Australia.

Despite the decision, the prime minister said his government remained committed to reducing greenhouse gases.

At the end of April, the Federal Minister for Resources and Energy, Martin Ferguson announced the Australian government would contribute additional funding of up to A$40 million toward the Calera mineral carbonation project if feasibility studies and a pilot plant prove successful.

Minister Ferguson said the Calera project involved an innovative technology that uses CO_2 captured from the Yallourn power station to make cement and aggregate material.

"This technology converts, rather than stores, CO_2 to make solid calcium and magnesium carbonate and bicarbonate minerals that can be used as valuable building materials.

"The real significance of this project is its potential to demonstrate carbon capture and use rather than carbon capture and storage," said minister Ferguson.

If the studies and the pilot plant indicate the construction of a demonstration plant is technically and commercially feasible, the Australian government will contribute additional funding of up to A$40 million toward the project.

"The Calera project is very exciting and will allow us to test the world's first carbonation process on brown coal to produce useful building materials and reduce CO_2 emissions from an existing coal-fired power station at the same time," Ferguson said.

Vietnam inks power deals

Vietnam's recent signing of two large power deals will be important in the country's ongoing efforts to increase generating capacity.

In mid-April the country signed a series of agreements worth more than $3 billion with Argentina for the development of wind and hydropower.

Under the agreements, Argentina's Pescarmona Metallurgical Industries (IMPSA) and the Vietnam National Oil and Gas Group (PetroVietnam) Power Corporation will work together in implementing wind and hydropower projects in Vietnam. The two firms also signed a Memorandum of Understanding (MoU) on the transfer of gas technology.

In a separate development, the Ministry of Industry and Trade (MoIT) also signed a Memorandum of Understanding with Malaysia's Janakuasa company for the construction of the $1.5 billion Duyen Hai 2 thermal power plant.

The 1200 MW plant will be built in Duyen Hai district, Tra Vinh province, starting in 2011. It is expected to become operational in 2014 or 2015.

The project will be built under a build-operate-transfer contract and the MoU provides a foundation for both sides to start negotiations on relevant contracts, including a power purchase agreement.

Bangladesh to sign nuclear deal as WB urges private investment

Bangladesh expects to sign a deal this year for a new nuclear power plant. The news comes as the World Bank urges the country to seek private sector investment to help meet power shortfalls. **Syed Ali**


PM Sheikh Hasina says power sector is an emergency

Bangladesh expects to sign a deal with Russia this year to build two nuclear power plants at a cost of at least $3 billion dollars. The two sides will sign the agreement when Bangladeshi Prime Minister Sheikh Hasina visits Russia later this year, said Dhaka's atomic energy chief Mosharraf Hossain. He said the deal has been finalised and that the cabinet has approved the draft.

Russia will build the 1000 MW plants near Bangladesh's northern town of Rooppur. The projects are expected to be complete by 2017.

Bangladesh has long suffered severe power outages as it has struggled to cope with an economy that has been growing at around six per cent a year since 2004. The crisis has worsened this year, as the gap between demand and supply has widened due to years of under-investment in new power plants.

The International Monetary Fund (IMF) in April said the country's economic growth would slide to five per cent a year – the worst performance in eight years – largely due to the worsening energy crisis.

The IMF urged Bangladesh to boost electricity generation through public-private partnership to spur the overall economy. "Stronger efforts are also needed to develop an effective framework for public-private partnerships in infrastructure development, especially power and energy," said David Cowen, the IMF mission chief.

Bangladesh needs up to $12 billion of investment over the next five years to meet energy and power demand that is growing at 8-10 per cent per year.

Prime Minister Sheikh Hasina has directed the power ministry and other relevant departments to consider power as an emergency sector and find fastest ways of implementing power projects.

Power secretary Abul Kalam Azad says the government plans to add 792 MW to the grid in 2010, 920 MW in 2011, 1369 MW in 2012, 1975 MW in 2013 and 1770 MW in 2014.

Last month, the Executive Committee of the National Economic Council approved the construction of three power plants and the improvement of the distribution network to increase generation of electricity in the country. One of the projects is a 150 MW combined cycle power plant in Sylhet and an associated transmission line.

The World Bank also recently said it would provide Bangladesh with $257 million for facilitating Private-Public Partnerships for setting up small power plants.

Subsequently, the Power Development Board (PDB) has invited pre-qualification applications from international companies for a 100-200 MW wind-powered independent power plant at Chittagong and three 1-3 MW solar-based IPPs in Rajshahi and Jamalpur.

The PDB also in late April signed a memorandum of understanding with UK-based company, Aggreko, to purchase 200 MW from two diesel-fired plants by July this year.

The two rental power plants are being set up without floating any tender to ensure fast-track power supply in view of the worsening electricity situation, officials said.

Indonesia to end subsidies

- Subsidies will cost government $15.73 billion this year
- Expansion plan will require $7.6 billion a year

Indonesia is planning to end fuel and electricity subsidies by 2014 in a move that will allow state utility PT Perusahaan Listrik Negara (PLN) to develop capacity and end power shortages.

Electricity and fuel subsidies together are expected to cost the government a total of 143 trillion rupiah ($15.73 billion) this year, some 13 per cent of total government spending, according to the draft revision of the 2010 budget. These estimates are based on an assumed oil price of $77 per barrel.

PLN has reported losses for many years as a result of having to sell electricity at below cost. The result has been a lack of development of its generating capacity and frequent blackouts.

The company has embarked on a major capacity expansion plan that calls for an average investment of $7.6 billion a year through 2018. Finance Minister Sri Mulyani Indrawati said the government plans to raise electricity rates by an average of 15 per cent in July to help PLN.

Indonesia has experienced an electricity crisis since 1998 because PLN's power capacity cannot meet the ever-increasing demand for electricity, causing power shortages and frequent blackouts across the country.

Currently the government is working on its second 10 000 MW electricity crash programme to increase generating capacity.

Last month PLN also said it would spend up to Rp 3.7 trillion ($410 million) to improve transmission and distribution and end blackouts in greater Jakarta.

Ngurah Adnyana, PLN's Java and Bali operational director said: "The project is called the 500 kV project. We will construct a network system… including a 150 kV cable underground line in the city and four high voltage substations." He says that the project could be completed by 2015.

At the end of March, the Asian Development Bank and Agence Française de Développement approved a $100 million loan for the Java-Bali Electricity Distribution Performance Improvement Project. The project will rehabilitate the overburdened distribution network of the two islands, as well as support the introduction of energy efficient compact fluorescent lamps and light emitting diodes, the ADB said in a news release.

"The project will reduce the power sector's carbon dioxide emissions by 330 000 tons per year, while the substantial energy savings and freeing up of 200 MW of equivalent distribution system capacity will allow the state electricity corporation to connect about 1.2 million additional customers to the Java-Bali network," said Sohail Hasnie, Principal Energy Specialist in ADB's Southeast Asia Department.

The country's goal to improve energy efficiency received another boost last month when the World Bank prepared a fund worth $400 million to help the country increase energy efficiency and reduce greenhouse gas emissions.

Meralco eyes power plant tie-ups

Manila Electric Co. (Meralco), the Philippines' largest electricity distributor plans to jump-start its foray into power generation by partnering with existing players.

Jose de Jesus, Meralco's president, said the utility has begun talks with power plant owners for possible tie-ups. "We have some under consideration, under some preliminary discussion, but it's too early to say. We are talking to some – those who have been privatised, for example. Maybe [we will] buy into them," he said.

Under existing regulations, distribution utilities can buy up to 50 per cent of their requirements from the power plants they own.

Meralco services over 6.4 million customers in Metro Manila and its outlying provinces. It is controlled by the Philippine Long Distance Telephone Co. (PLDT) Group. Two of Meralco's minority owners – the Lopez Group and San Miguel Corp. – own power generation assets.

The PLDT Group, the Lopez Group, and Ayala Corp earlier teamed up for the acquisition of power generating units that the government will privatise.

De Jesus said Meralco's plan to move into generation was brought about mainly by the impending opening up of the power sector. Under open access, eligible consumers – starting with users of at least 1 MW – may choose their suppliers, freeing them from the supply contracts that distribution utilities signed on their behalf.

Meralco estimates that around 25 per cent of its total sales of around 27 000 kWh last year would be opened up to the retail market once open-access kicks off.

The utility would still retain the distribution services of its customers but would also have the opportunity to generate their electricity requirements once it has its own power plants.

With the competitive market expected to start as early as next year, Meralco is planning to acquire its own power plant as early as this year.

"At the short-term we have to look at brownfield [plants] to take care of the short-term requirements that we anticipate will happen as early as 2011. In the long-term, of course we could look at greenfield [sources]," de Jesus said.

Nuclear site allocated to Indian JV

A joint venture of the Nuclear Power Corporation of India Limited (NPCIL) and the National Thermal Power Corporation (NTPC) is expected to build two 700 MW nuclear power plants at a site identified by the Department of Atomic Energy (DAE).

"One of the sites identified by the DAE for a 2x700 MW plant will go to the NPCIL-NTPC joint venture company," DAE Secretary Srikumar Banerjee told reporters on the sidelines of the India Energy Congress in April.

While two plants each are expected to come up at Rawat Bhata in Rajasthan and Kakrapar in Gujarat, there are also plans to finalise sites in Haryana and Madhya Pradesh. Sources said the site either in Madhya Pradesh or Haryana might be allocated to the NPCIL-NTPC joint venture.

NPCIL and NTPC began their nuclear JV in February last year. NPCIL has plans to build indigenously developed Pressurised Heavy Water Reactors (PHWRS) of 700 MW capacity each at four locations across the country.

India's nuclear plans received a minor setback in March when Australia maintained that it would not sell uranium to the country.

Australia had started negotiations with India on uranium sales but the new government, which came into power in 2007, ruled out exports unless India signs the Nuclear Non-proliferation Treaty.

UK in drive for new climate deal

Kyoto deal could end deadlock
Climate research investigation published

Siân Crampsie

The British government has proposed a revival of the Kyoto Protocol in an attempt to "breathe new life" into international climate change talks.

It has published a new international climate action plan in which it says it is open to extending the Kyoto agreement "as a way of getting the legal deal we need".

The move represents a U-turn on the position of the UK in international climate change negotiations. It comes as climate scientists attempt to repair credibility in their field following the recent "Climategate" scandal.

"We've got to dust ourselves down and kick-start efforts to get a global deal, get the climate finance flowing and make sure the cuts promised by countries happen," said UK Energy and Climate Change Secretary Ed Miliband. It is not yet clear which countries will support the UK's new position.

At the Copenhagen talks in December last year, developing nations wanted to extend the Kyoto Protocol while developed countries wanted it scrapped in favour of a new global agreement. The impasse meant that no legal treaty was reached at Copenhagen.

The UK's new action plan on climate change also pushes for the EU to increase its emissions cuts.

Elsewhere in the UK, a report commissioned by the University of East Anglia (UEA) has cleared the scientists at the heart of the Climategate row of any scientific impropriety and dishonesty.

The report is the latest scrutiny of research carried out by UEA's Climatic Research Unit (CRU) – widely regarded as a leading climate change research centre – and has recommended that scientists involved in CRU's work engage the services of professional statisticians in order to prevent future misunderstandings.

The scandal erupted after hacked emails from CRU's server were published, apparently indicating how statistical "tricks" had been used to exaggerate global warming trends.

Climate change sceptics have used the scandal to discredit the science behind global warming and the impacts of climate change. Other recent errors – including a claim by the IPCC that

Ed Miliband: "We've got to dust ourselves down and kick-start efforts

Himalayan glaciers would disappear by 2035 – have added fuel to the fire.

UEA's CRU says that it is "already making improvements" with regards to the report's recommendations. Two other investigations into its research – an original peer review and an inquiry by the Parliamentary Science and Technology Committee – have also exonerated the centre's work.

Renewables could meet 100 per cent of Europe's needs

Early investment needed
Concerns over CCS spending

Christian Kjaer: CEO of the European Wind Energy Association

Renewable energy advocates have called on the European Union to boost investment in renewables and say that technologies such as wind and solar power could meet all of Europe's power needs by 2050.

Speaking at the recent European Wind Energy Conference and Exhibition in Poland, Christian Kjaer, CEO of the European Wind Energy Association (EWEA), said that wind power could meet half of Europe's power needs by 2050 "if the necessary changes to infrastructure and markets are made". He added: "I am also confident that other renewables can easily meet the other half of Europe's electricity needs".

His comments echo a recent report published by non-profit group the European Climate Foundation (ECF), which says that the EU could rely on renewables for all of its electricity needs, particularly if projects such as Desertec are realised. But it says that the EU must spend some €30 billion per year to meet its 2050 climate targets.

The ECF also notes that spending now in order to achieve climate and renewables goals will help to minimise the impact of the investments on electricity prices. It says that waiting until 2020 to begin work on producing zero-carbon electricity would drive the yearly costs up to €65 billion by 2035.

Another recent report co-authored by McKinsey indicates that replacing Europe's existing infrastructure with low-carbon alternatives should not raise electricity prices in the long term.

EWEA and other renewable energy groups are also maintaining pressure on the EU to support renewables instead of other low-carbon technologies such as carbon capture and storage. "We should be talking about a renewable energy economy not a low carbon one," said Arthouros Zervos, President of EWEA.

"Renewable energies can provide 100 per cent of Europe's power supplies by 2050 without any further contribution from any so-called low-carbon technologies."

EWEA's views echo those of Green Member of the European Parliament Claude Turmes, who has expressed concerns over plans to fund carbon capture and storage (CCS) projects through the planned sale of carbon allowances from the EU Emissions Trading Scheme (ETS).

The European Commission is planning to give eight CCS projects around €500 million each. If the sale of carbon allowances raises €4.5 billion, this would only leave €500 million to be divided between 34 planned renewable energy projects, says Turmes.

The amount of money raised from the sale of carbon allowances will depend on the value of permits at the time of the sale. Spot prices currently stand at around €13.50 – €1.50 below what would be needed to raise €4.5 billion at the sale.

EWEA has also expressed a clear vision of a pan-European electricity grid and full integration of the electricity markets. "Energy is an international challenge," said Kjaer. "It is astounding that 24 years after establishing free movement of goods, services, capital and labour, the EU has not yet established a fifth freedom: free movement of electricity."

Belene on track to select consultant

The Belene nuclear power project is once again starting to gain momentum following the withdrawal of German group RWE last year.

Bulgaria's Ministry of Energy and the Economy has revealed the six companies that have placed expressions of interest to act as consultants on the 2000 MW project and says that it expects to select a consultant and sign a contract by mid-June.

The consultant will be required to review project plans for the construction of the plant as well as update its financial and economic model. Construction on the project will only continue after the selection of a new strategic investor, according to the Bulgarian government.

The bidders in the selection procedure for a consultant are HSBC, Société Générale, a consortium between KPMG and Maguire, Rothschild, Arjil and Ernst and Young.

Russian firm AtomStroyExport has the contract to build Belene and its parent company, Rosatom, has offered to help finance the project.

NDA confirms £2.8 billion plan

The UK has published plans for the next stage of its planned nuclear clean-up operation.

The Nuclear Decommissioning Authority (NDA) says that it will spend £2.8 billion in the next fiscal year (2010/2011), £1.5 billion of it on the Sellafield site alone.

It is also seeking to improve on efficiency savings already made, targeting £30 billion for the year, and says that its commercial operations will bring income of £1.15 billion.

The NDA, established in 2004 to oversee the decommissioning of the UK's early nuclear assets, is also playing a key role in the UK's plans to develop a new fleet of nuclear power plants since many of its 19 sites are considered suitable for new build projects.

Last year it raised £387 million by auctioning three parcels of land to prospective nuclear plant developers.

Tony Fountain NDA Chief Executive Officer said: "Our work programme is moving at speed and we have achieved much in our first five years. But, it has never been more important for the NDA to focus on value for money as we seek to progress our clean-up mission over the next year and beyond."

At Sellafield, some of the £1.5 billion earmarked for the next year will be spent on the completion of the evaporator D structure – a vital component of the reprocessing programme which reduces the Highly Active Liquid waste stored on site. This is the single biggest construction project anywhere in the UK nuclear industry, estimated to cost £400 million, says the NDA.

WB loan essential for security, says Eskom

- Environmental groups criticise loan
- World Bank hopes to boost renewables


Medupi power plant: attracting funding and controversy

Siân Crampsie

The World Bank has been strongly criticised for approving a loan to South Africa that will be used to finance a coal-fired power plant.

The $3.75 billion loan is urgently required to improve energy security and boost development in South Africa, argues the country's state-owned utility Eskom. Critics, however, say that Medupi power plant – towards which most of the funds will be directed – will be environmentally and socially destructive.

Representatives from three key World Bank shareholder countries – the US, the UK and the Netherlands – abstained from the vote at a meeting of the Bank's Executive Board in a clear show of dissent. It is the first World Bank loan approved for South Africa since the end of apartheid in 1994.

The 4800 MW Medupi power plant is seen by South Africa's government and industrial sector as being essential for the country's energy security and economic stability. The energy-intensive natural resources sector in particular is keen to avoid a repeat of the 2007/2008 power cuts.

"Without an increased energy supply, South Africans will face hardship for the poor and limited economic growth," said Obiageli K. Ezekwesili, World Bank Vice President for the Africa Region. "Access to energy is essential for fighting poverty and catalysing growth, both in South Africa and the wider sub-region."

Eskom also welcomed news of the loan. "The World Bank loan significantly contributes to the provision of base load power," said Eskom's Acting Chairman, Mpho Makwana. "Improved energy security will advance South Africa's development agenda for economic growth and human up-liftment in South Africa and the region."

The US Treasury said that it abstained from voting on the loan due to concerns about the climate impact of the project and its incompatibility with the World Bank's commitment to be a leader in climate change mitigation and adaptation. Similarly the Netherlands said it could not approve the loan as not enough is being done in South Africa to develop alternatives to coal.

Concerns have also been raised that South Africa's ruling African National Congress will benefit from the loan as it is a shareholder in Hitachi, the firm that is supplying the plant's boilers.

Environmental groups, including Earthlife Africa and GroundWork, say they will continue to oppose the project and raise their concerns with the World Bank.

South Africa's supporters have pointed out that the US and the UK are allowing coal-fired power projects to go ahead.

While $3.05 billion of the loan will be used to finance Medupi, $260 million will go towards piloting a utility-scale 100 MW wind power project in Sere and a 100 MW concentrated solar power project with storage in Upington. A further $485 million will finance low-carbon energy efficiency components, including a railway to transport coal.

"As part of the project, Eskom will pilot 100 MW of solar power with storage and wind power, the biggest grid-connected renewable energy venture in any developing country," said Vijay Iyer, World Bank Energy Sector Manager for Africa. "We are optimistic that the lessons learned from these projects will facilitate the scale-up of the renewable energy industry across Africa."

Russia signs deal on nuclear bank

- Russia to fund world's first LEU fuel bank
- Bushehr on schedule for summer start-up


Sergey Kiriyenko: Director General of Rosatom

The International Atomic Energy Agency says that the creation of a low enriched uranium (LEU) reserve will help to protect member states against possible supply disruptions.

At the end of March IAEA Director General Yukiya Amano and the Director General of the Russian Federation's State Atomic Energy Corporation (Rosatom), Sergey Kiriyenko, signed an agreement to set up the world's first nuclear bank. The IAEA says that the bank will eventually hold a stockpile of 120 tons of LEU.

The bank will be located in the southern Siberian city of Angarsk at the site of an existing uranium enrichment centre and is the result of years of planning. LEU from the reserve will be supplied to IAEA member states that require it for civilian purposes at the prevailing market spot price.

Russia will fund the establishment and maintenance of the bank, including the costs of storage, safety, security and safeguards. It says that supplies will be made only in cases of urgent need and after a formal request is made to the IAEA.

According to analysts, one of the original drives for the creation of the bank was to provide Iran with an alternative to creating a domestic uranium enrichment regime. While it is recognised that this objective will not be met, it is thought that the bank could still provide technical help to other nations that are considering the development of nuclear power plants.

Iran said last year that it had already embarked on a uranium enrichment programme. In April the country's Atomic Energy Organization (AEOI) confirmed that the Bushehr nuclear power plant would be started up this summer as planned.

Construction of the 1000 MW plant began in the 1970s but was later abandoned. Russia's AtomStroyExport is now completing the project and is also contracted to supply its fuel.

ADB funds Central Asia's first CCGT

Uzbekistan will play host to Central Asia's first combined cycle gas turbine (CCGT) power plant after the Asian Development Bank (ADB) approved a $350 million loan.

The 800 MW power plant will boost energy security in the country and improve energy efficiency levels. Uzbekistan has the most industrialised and energy intensive economy in Central Asia, according to the ADB.

The total cost of the project will be $1.28 billion. ADB will source an initial $340 million tranche with a repayment period of 25 years and a grace period of five years, A second, $10 million concessional loan facility will also be drawn.

"The project is the least-cost and low-carbon solution to ensure energy security. Advanced power generation technology will cut the high energy intensity levels and increase energy productivity," said Bayanjargal Byambasaikhan, an energy specialist at ADB's Central and West Asia department.

Uzbekistan uses four times more energy than the world average to produce one dollar of gross domestic product. This is due to aging and dilapidated energy infrastructure, low technological base, lack of investment and inefficiency, said the ADB in a statement.

Sudan signs 2 GW CSP deal

Sudan is to see the development of 2000 MW of concentrated solar power (CSP) capacity over the next decade after its government signed a deal with Solar Euromed.

The French solar power company says that under the terms of the exclusive agreement – signed in March with Sudan's Ministry of Energy and Mining – two projects totalling 250 MW will enter operation by 2014. It says that these projects will contribute to the stabilisation and development of the Sudanese population.

"The Solar Programme in Sudan may well become a new world-class model by integrating renewable energy resources in the surrounding land while producing dispatchable electricity and water. And it could easily be extended to countries with similar climates," said Dr. Omer Mohammed Kheir, Secretary General of Sudan's Ministry of Energy and Mining. "We expect that it will provide a means of meeting the urgent demand for food in the region by creating suitable land for agricultural production."

GE to develop 4 MW wind unit in Europe

- New unit will target offshore industry
- Four countries chosen for expansion plans

Ferdinando Beccalli-Falco: offshore wind has a bright future in Europe

US conglomerate GE is putting the development of its next generation wind turbine, a 4 MW offshore unit, at the heart of its European wind expansion plans.

The new 4 MW unit will be the largest wind turbine in GE's fleet and will incorporate advanced drive train and control technologies gained through GE's acquisition of ScanWind.

Last month GE signalled its "deep commitment to the promising European offshore wind sector" with plans for a major expansion of its wind turbine manufacturing and service facilities in the region.

The company selected sites in four countries – the UK, Norway, Sweden and Germany – where it will invest a total of €340 million by 2020.

"Offshore wind will play a vital role in meeting the growing global demand for cleaner, renewable energy and has a bright future here in Europe," said Ferdinando Beccalli-Falco, president and CEO of GE International. "These investments will position us to help develop Europe's vast, untapped offshore wind resources, while also creating new jobs for both GE and our suppliers."

The European Wind Energy Association (EWEA) is expecting Europe's offshore wind power sector to grow by more than 70 per cent in 2010, with continued strong growth in years to follow due to the renewable energy plans of several major countries in the region.

GE wants to position itself to take advantage of upcoming market opportunities and compete effectively with the current offshore market leader, Siemens.

Of the planned investment, up to €110 will be spent in the UK where GE plans to establish its offshore wind turbine manufacturing function. GE will locate application and service engineering resources in the country and will bring partners and suppliers of towers, blades, nacelles and other offshore wind components to the manufacturing facility.

The decision is good news for the UK government, which has been trying to attract the wind turbine manufacturing sector to underpin the massive expansion of offshore wind power planned in the country.

In Norway, GE will add to its existing presence by investing €75 million by 2016 in a new offshore technology development centre in Oslo and the expansion of its advanced demonstration unit production and service facilities in Verdal.

In Sweden, GE will expand its current offshore wind facilities by developing a Conceptual and Systems Design Centre in Karlstad, and a technology demonstration unit in Gothenburg harbour.

In Germany the company is planning to build a new engineering centre in Hamburg and will also expand wind turbine facilities in Salzbergen and Munich.

Mirant and RRI seal merger deal

The US power generation industry is to witness the creation of a new independent power producer with the merger of Mirant and RRI Energy.

The two companies have agreed an all-share deal to create GenOn Energy, which will own nearly 25 GW of generating capacity across the USA and which will have a market capitalisation of $3.1 billion. The new company will benefit from consolidation savings, greater financial strength and a diverse generation fleet, says Mirant.

The proposed merger requires shareholder and regulatory approvals and is expected to close before the end of 2010. GenOn Energy will be one of the largest independent power producers in the USA, where the recession has caused energy demand to drop over the last two years with a corresponding fall in electricity prices.

"Bringing together RRI Energy and Mirant is a true merger of equals, combining two companies with complementary strengths, a shared strategic vision and a commitment to value creation," said Edward R. Muller, Chairman and CEO of Mirant. "This compelling combination will create tremendous value for stockholders of both companies as our business benefits from cost savings, greater scale, and enhanced financial strength and flexibility."

According to Mirant, the merger will result in annual cost savings of $150 million resulting from reductions in corporate overheads. GenOn Energy will also have "ample liquidity", says Mirant, providing it with "added stability through industry cycles".

Mirant currently owns and leases a total of 10 076 MW of capacity while RRI owns and leases 14 581 MW. The combined fleets are largely complementary, with limited overlap in their respective operating regions.

"We are committed to delivering the cost savings benefits and successfully integrating Mirant and RRI Energy," said Mark M. Jacobs, president and chief executive officer of RRI Energy. "We will bring together the best operating practices from both organisations, building on our excellent track records."

New head at Vattenfall helm

Øystein Løseth, the new head of Swedish giant Vattenfall, says that his main focus in his new role will be improving the profitability of the company after a decade of expansion across eight European countries.

Norwegian Løseth has not ruled out further expansion but is more likely to consolidate on Vattenfall's positions in existing markets as well as meeting the green targets set for the firm by his predecessor Lars Josefsson.

Løseth has come to Vattenfall from Dutch firm Nuon, which Vattenfall acquired last year. Last November he was appointed first senior executive vice president in Vattenfall AB and deputy CEO for the group.

Vattenfall recently posted a 34.5 per cent rise in net sales for the first quarter of 2010 and a fall in operating profit for the period of 21.3 per cent to SEK10 115 million.

E.On takes risks out of renewables

- No gain, no fee model
- EPG combined technical and financial elements

European utility E.On is hoping to boost the pace of growth in the renewable energy sector by offering a service that removes the risks associated with the purchase of renewable energy technologies.

The company's UK arm has teamed up with on-site renewable energy specialist Self Energy to provide the Energy Performance Guarantee (EPG), a service with a 'no gain, no fee' arrangement. The service is an ideal model for hotels and universities, says Self Energy.

The EPG service aims to overcome the main barriers to investments in renewable energy by funding and fitting renewable technologies such as rooftop solar panels and wind turbines. The client then pays back the initial upfront costs over time through reduced energy bills over a fixed contract period.

Combining financial and technical elements makes a lot of sense as it lowers the risks for the end-customer associated with green technology spending, according to market analysts Datamonitor, which said in a research note that, "Most companies have limited understanding of green technologies in terms of adoption and profiting from them, so the ability to leverage E.On's and Self Energy's knowledge and experience will be a huge selling point."

Alstom UK directors questioned

French engineering firm Alstom says that it is cooperating with British authorities following the arrest of three of its directors in the UK.

The UK's Serious Fraud Office (SFO), which investigates corruption and major fraud, arrested and questioned the three individuals as part of an investigation into bribery and corruption. The three were later released without charge. Officials also raided Alstom offices in the UK.

The SFO says that it suspects that bribes have been paid by Alstom's UK operations in order to win contracts overseas and is also investigating associated money laundering offences. Swiss officials have been investigating Alstom for several years.

Americas

Siemens wins Texas wind order

Energy firm E.On has placed an order with Siemens for the supply of wind turbines for the Papalote Creek II wind power plant in Texas, USA.

The Papalote Creek II wind farm will have an installed capacity of over 200 MW and is expected to be commissioned in late 2010. Siemens will supply 87 of its SWT-2.3-101 wind turbine units to the project, with delivery starting this month.

Siemens will also provide service and maintenance to the project for two years.

Canadian Solar plans PV projects

Canadian Solar is planning to build 176 MW of photovoltaic capacity in Ontario after being awarded contract offers under the province's new Feed-in Tariff (FIT) programme.

The Ontario-based firm says it is planning to complete the projects in 2011 and 2012 after obtaining final project consents. The Ontario Power Authority will buy 100 per cent of the power and renewable energy credits from the Canadian Solar projects under the FIT programme.

Asia Pacific

BHEL to build 1600 MW project

Raichur Power has placed a contract with Bharat Heavy Electricals Limited (BHEL) for the construction of a 1600 MW supercritical power project in Karnataka, India.

Valued at INR63 billion ($1.4 billion), the contract includes the design, engineering, supply, construction and commissioning of two 800 MW coal-fired units at Yeramarus in Raichur district.

Raichur Power is a joint venture between Karnataka Power and BHEL.

Daewoo wins Java order

South Korea's Daewoo Engineering Co. has signed a deal with Indonesia's Merak Energi Indonesia to build a new coal-fired plant on the island of Java.

Under a $181 million contract, Daewoo will design and construct the 120 MW plant in the city of Serang. Construction will be completed by October 2013, says Daewoo.

NTPC selects ABB control solution

India's National Thermal Power Corporation (NTPC) has selected ABB to supply and install an integrated control and instrumentation solution for a 1320 MW supercritical thermal power plant in Bihar, northern India.

Under a contract described by ABB as "extensive", the Switzerland-based engineering company will provide the Barh 2 plant with a state-of-the-art distributed control system.

The Barh 2 plant is an extension to the 1980 MW Bahr 1 supercritical plant, which is also under construction.

ABB's scope of supply for Barh 2 includes a distributed control system for the main power plant and auxiliary systems, field instrumentation including process analysers and emission monitoring systems, a plant information management system, and large video screen systems for the central control room.

Philippines plans two biomass plants

Two subsidiaries of Global Green Power plc Corp (GGPC) have signed contracts with Poyry Energy Inc. and DP CleanTech for the construction of two biomass power plants in the Philippines.

With a capacity of 17.5 MW each, the plants will provide grid-connected, sustainable base load renewable energy. Green Power Bukidnon Philippines Inc., another GGPC subsidiary, has signed a letter of intent for a further 35 MW plant in Bukidnon.

Under contracts with Green Power Panay Philippines Inc. and Green Power Nueva Ecija Philippines Inc., Poyry Energy and DP CleanTech will engineer, procure and construct the two biomass plants – one in Mina, Panay Island, and one in Nueva Ecija, Luzon.

Both plants will use local agricultural waste as fuel. The GGPC subsidiary companies have secured long-term 25-year biomass supply contracts through sister company Global Biomass PLC Corp.

Siemens secures Chinese order

Siemens Energy has received an order to supply key components for four 250 MW combined cycle units at the Ningxia East thermal power plant in China.

Working as a subcontractor to Shanghai Electric Power Generation Co. Ltd., Siemens will supply the key components for the new plants' gas turbines. The four new plants will be operated by Ningxia East Thermal Power Co.

Siemens has also signed a major long-term service agreement for the equipment.

Europe

REpower to supply Turkish project

REpower has concluded a contract with Al Yel Elektrik for the supply of wind turbines for a project in Turkey.

The German-based wind turbine producer will supply 44 of its 3.XM units for the Geycek wind farm in Kirsehir province. The units will be delivered in mid-2011.

"Turkey is a wind market with huge potential… experts are speaking of volumes of up to 20 000 MW," said Per Pedersen, CEO of REpower. "Turbines with a generating capacity of almost 1000 MW are already in operation there."

Nuon updates Hemweg site

Dutch utility Nuon is to replace an existing power unit at its Hemweg site with a modern combined cycle gas turbine power plant.

The new plant – Hemweg 9 – will be built by Siemens and will replace the Hemweg 7 plant. Siemens has signed an engineering, procurement and construction contract as well as a long-term maintenance contract.

Hemweg 9 will have a capacity of approximately 435 MW and will also be designed for easy conversion to heat production in the future, says Nuon.

Construction is scheduled to start in June 2010 and the plant will be operational at the end of 2012.

EWE places Riffgat order

Siemens Energy has been contracted by EWE AG and Enova GmbH & Co KG to supply 30 wind turbines for the Riffgat wind farm in the North Sea.

With a total capacity of 108 MW, Riffgat will be one of the first commercial wind farms in German waters. Siemens will equip the project with its 3.6 MW wind turbine units.

Dr. Thomas Neuber, EWE's Chief Officer of Procurement and Production said: "With the erection of alpha ventus, Germany's first offshore wind farm, EWE has paved the way for offshore power generation in Germany."

The Riffgat wind farm will be erected 15 km northwest of the north Frisian island of Borkum. Initial civil works on the 6 km^2 site are scheduled to commence in 2011.

ABB wins offshore platform link

ABB has won an order worth $110 million from Eni Norway AS to build a power link between a new oil and gas platform in the Barents Sea and the Norwegian power grid.

The Goliat platform will be partly electrified by a 106 km subsea power cable, a move that will help to reduce emissions of carbon dioxide from the platform. The 123 kV, 75 MW XLPE insulated cable to be installed by ABB will be the longest, most powerful cable ever delivered for an offshore application.

The project is scheduled for completion by the end of 2013, when Goliat is due to begin operations.

Skanska to build Norway hydro plants

Norway's Statkraft has awarded Skanska of Sweden a NOK254 million ($42.5 million) contract to build two hydropower plants in the Hoyanger municipality in Sognefjorden, Norway.

The two new power plants, Eiriksdal and Makkoren, will take advantage of the natural vertical fall of the Hogsvatnet and Daleelva rivers and will produce a combined annual output of 340 GWh. Skanska will be responsible for construction of the plants and related civil engineering work.

The new power plants will replace three older plants. The site work will commence immediately and the projects are scheduled for completion in three years.

International

Siemens receives Russia order

German engineering firm Siemens is to supply the main components for a new combined cycle power plant in Russia after receiving an order from Atomstroyexport.

The Yuzhnouralskaya GRES-2 combined cycle power plant is being built approximately 100 km south of Chelyabinsk by Atomstroyexport. The owner of the plant is Russia's OJSC Third generating company (OGK3).

Siemens will supply a SCC5-4000F 1 S power train, which comprises an SGT5-4000F gas turbine with a capacity of 288 MW, a steam turbine, a hydrogen-cooled generator and a turboset I&C system. When commissioned in 2012, the new plant will supply power to the southern Urals region.

Alstom wins Moroccan wind contract

Alstom has secured its first wind project in Morocco. It signed a contract with Nareva Holding, a subsidiary of ONA, the leading Moroccan industrial and financial group, for a new wind farm in Akhfenir.

The wind farm, to be commissioned in 2011, will consist of 61 Alstom ECO 74 wind turbines totalling more than 100 MW of renewable energy to be supplied to private industrial customers in Morocco, mainly as part of the Energipro scheme.

Alstom will supply, install and commission the wind farm and is responsible for operation and maintenance during the first five years.

The new contract underlines Morocco's commitment to reaching 42 per cent of its electricity generation capacity from renewable sources by 2020, one third of it from wind energy.

Iberdrola boosts Romanian wind sector

Iberdrola Renovables has been awarded a license by the Romanian grid operator Transelectrica to develop wind farms in the country with a total capacity of up to 1500 MW.

The Spanish renewable energy firm says that the license will pave the way for it to roll-out development of the Dobruja project, a collection of 50 wind farms in southeast Romania. It is intending to build these projects between 2011 and 2017.

Iberdrola Renovables is implementing all its projects in Romania with Eolica Dobrogea, which has been tasked with planning and obtaining the construction permits. Iberdrola Renovables will be responsible for constructing and operating the wind farms.

GDF Suez signs contract for Green Unit

GDF Suez has signed a contract with engineering firm Foster Wheeler for the construction of a 190 MW biomass-fired power plant in Poland.

The plant – known as the Green Unit – will burn wood and agri-fuels and will be located in Polaniec, southeast Poland, at the site of GDF Suez's 1800 MW coal and biomass co-fired power plant. Foster Wheeler will design and construct the circulating fluidized bed boiler.

Dirk Beeuwsaert, vice president of GDF Suez in charge of energy Europe & international, said: "Building this Green Unit in Poland, as well as developing new wind farms, underlines GDF Suez's strong commitment to sustainable development and to the Polish market."

Nigeria chooses Alstom

Alstom has signed a contract worth around €40 million with the Rivers State Government of Nigeria to deliver a GT13E2 gas turbine to the Port Harcourt power plant located in Rivers State, Nigeria.

The construction of the 182.2 MW gas turbine is already underway in Birr, Switzerland, according to Alstom. The unit is scheduled to enter operation at the end of 2011.

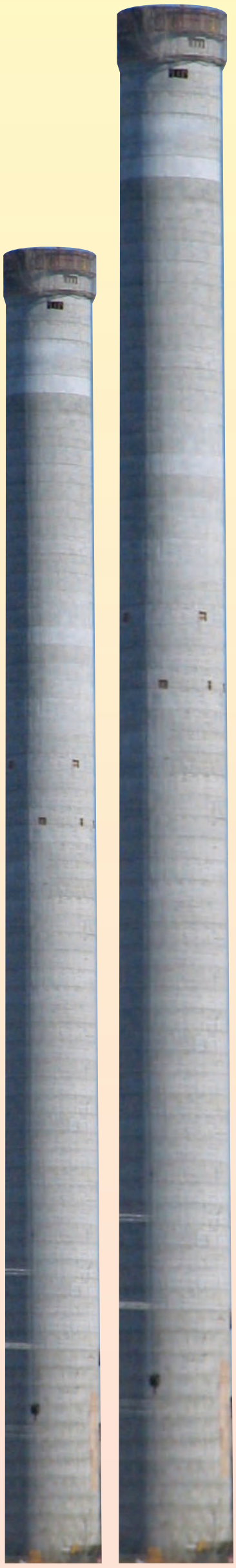
Start-up of the new plant will boost generating capacity in the Port Harcourt area, which has been suffering from serious power shortages. Electricity generating capacity in Nigeria currently stands at around 4000 MW.

Wärtsilä to supply Kribi project

Finnish company Wärtsilä has signed a contract to supply and install what is claims is the largest gas engine power plant ever to be installed on the African continent.

The power plant will be located in Kribi, a sea port lying on the Gulf of Guinea coast in the Republic of Cameroon. The €120 million order for the project was placed by Kribi Power Development Company (KPDC), an affiliate of AES Corporation.

The power plant is scheduled to be commissioned and operational before the end of 2011. Wärtsilä's scope of supply includes 18V50DF dual-fuel engines that will run primarily on gas.



Concentrating on solar

Late last year, Siemens purchased Solel, one of the world's two leading suppliers of solar receivers. **Junior Isles** talks to Siemens' **René Umlauft** about the prospects and challenges facing concentrating solar power.

The increasing publicity surrounding concentrated solar power (CSP) may give the impression it is a relatively new technology but it has in fact been around for nearly 100 years. However, it was not until the 1980s that the first small boom occurred, driven by the oil price shocks of the 1970s. This early interest, however, was short-lived as oil prices began a steady decline.

Today, the interest has been rekindled by the drive to reduce man-made carbon dioxide emissions, widely argued as the cause of global warming, as well as CSP's ability to overcome the intermittency normally associated with solar power.

René Umlauft, CEO of Siemens renewable energy division notes: "Energy prices of oil and gas will increase in the long term. This, combined with an increasing awareness that we have to do something about our environment has seen an increase in the use of renewable energy. Concentrating solar power has some advantages compared to other renewables. It has a relatively stable power output. For example, unlike photovoltaics it is unaffected by passing clouds. With thermal storage such as molten salt, you can store the energy for electricity production in the evening peak hours. This means the technology can move in the direction of base load operation."

In October last year, Siemens made a significant move to strengthen its position in the CSP market with the acquisition of Solel Solar Systems for $418 million. Solel is one of the world's two leading suppliers of solar receivers. It produces solar troughs and is involved in the manufacture and installation of solar fields for large-scale solar energy production.

Concentrated solar thermal power systems use lenses or mirrors and tracking systems to focus sunlight onto a small area. The concentrated light is then used as heat or as a heat source for a conventional power plant.

A wide range of concentrating technologies currently exist, including the parabolic trough, Dish Stirling, Concentrating Linear Fresnel Reflector, Solar chimney and solar power tower.

Trough systems are the most popular CSP technology. A parabolic trough consists of a linear parabolic reflector that concentrates light onto a receiver positioned along the reflector's focal line. The receiver is a tube positioned directly above the middle of the parabolic mirror and is filled with a working fluid. The reflector follows the sun during the daylight hours by tracking along a single axis. A working (storage) fluid is heated as it flows through the receiver and is then used as a heat source for a power generation system.

There are several hundred projects in different stages of development in countries like Australia, Chile, India, the US and Spain, as well as countries in north Africa and the Middle East – essentially any region where there is plenty of sunshine.

According to industry forecasts, the market looks set to grow rapidly over the next 10 years. Data from Energy Emerging Research and Siemens show the market growing from €8 billion in 2011 to €23 billion in 2020. Umlauft noted: "In the next 10 years, I see CSP being a multi-billion, multi-gigawatt market."

The development of CSP, however, still faces a number of major challenges. The main one, according to Umlauft is to drive down costs so that the technology reaches wholesale parity. "We should reach wholesale parity in the mid-term, at least for peak applications. It will take time but moving to larger project sizes will help drive costs down. Countries are coming up with 80-100 MW projects or even higher, which will reduce costs due to economies of scale," he says.

The other challenge is increasing efficiency. Typical overall annual efficiency for a parabolic trough CSP plant with a thermo-oil receiver is 12-15 per cent. With a molten salt receiver, average annual efficiency is expected to be above 18 per cent.

Work is ongoing to optimise the operation of the solar receiver and troughs. Umlauft notes: "Increasing efficiency essentially means finding better ways of getting the sun into the receiver without letting it out. Improving the coatings on the glass will be a key area of improvement."

Governments have an important role to play in improving the growth in CSP. Feed-in tariffs, which have been very effective in Germany, grants and target-setting are all forms of support being used by governments.

Umlauft comments: "More government support will increase demand so that suppliers can industrialise the manufacturing and assembly processes and consequently, drive down costs. If you look at the wind industry, 20-30 years ago, capital costs were around €3 million per MW. Today the cost of a 1 MW wind turbine is about €1 million or less in some countries."

Depending on the country of installation, Umlauft estimates that capital costs for CSP are currently in the region of €4000/kW with storage but are on the way down. "Costs can be reduced by 10 per cent for a large scale application. Costs have to come down significantly, perhaps by 50 per cent, but I cannot give a timeline by when this will happen."

Technology advances will also help lower capital costs. Increasing efficiency will also help reduce installed costs since it allows the same power output from a smaller solar field. This means lower costs for land, troughs etc. Increasing the temperature of the thermal storage medium by using molten salt or direct steam instead of oil for example, will allow more power to be produced from a smaller area.

Siemens sees this as an important area of development and last year purchased shares in Archimede Solar, a supplier of molten salt technology.

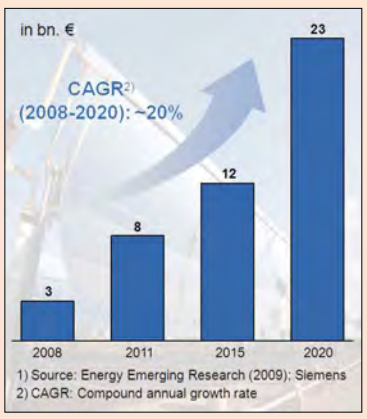
Siemens is expecting that its purchase of Solel will also help to reduce costs. "Solel has expertise in producing high efficiency receivers while Siemens has knowledge in areas that can support CSP. Because we have the steam turbine power block and the instrumentation and control, we can now optimise the entire system. It's another opportunity to increase efficiency and reduce costs," says Umlauft. Siemens' presence in more than 190 countries together with its broad base of contacts with utilities and independent power producers will further speed up the deployment of CSP, he added.

Umlauft predicts we will see CSP develop in the same way as wind and is hoping to repeat "the success of the wind business". He concludes: "If we compare the technologies, we are at the same stage that wind was at several years ago." If this is true, CSP has a very bright future.

René Umlauft, CEO of Siemens renewable energy division: CSP will develop in the same way as wind

> "We should reach wholesale parity in the mid-term, at least for peak applications. It will take time but moving to larger project sizes will help drive costs down…"

Market development of solar thermal power plants



A brief history… and ambitious future

Man has used concentrated sunlight to perform one task or another for hundreds of years. Legend has it that Archimedes used a "burning glass" to concentrate sunlight on the invading Roman fleet and repel them from Syracuse.

In 1866, Auguste Mouchout used a parabolic trough to produce steam for the first solar steam engine. Twenty years later, the first patent for a solar collector was obtained by the Italian Alessandro Battaglia in 1886.

Over the following years, inventors such as John Ericsson and Frank Shuman developed concentrating solar powered devices for irrigation, refrigeration, and locomotion. In 1913 Shuman completed a parabolic solar thermal energy station in Meadi, Egypt for irrigation.

The first plant to use the architecture of today's solar concentrated plants, with a solar receiver in the centre of a field of solar collectors, was built by another Italian, Professor Giovanni Francia. This began operation in Sant'Ilario, near Genoa, Italy in 1968. The plant was able to produce 1 MW with superheated steam at 100 bar and 500ºC.

Now 40 years later an ambitious project is being planned for the future. Desertec is a concept that will make use of solar energy and wind energy in the deserts in North Africa and Middle East.

Under the plan, concentrating solar power systems, PV systems and wind parks would be located on 17 000 km² (6500 square miles) of the Sahara Desert. Electricity from the projects would be transmitted to European and African countries by a super grid of high voltage direct current cables.

The Desertec Industrial Initiative (DII) was officially launched by 12 European companies in July 2009 to determine the feasibility and create a detailed plan for the project. Since then a number of companies have joined the DII.

Most recently, March saw a number of key market players join the initiative. Italian utility, Enel became members along with French building materials maker Saint Gobain. The DII also announced that Spanish power grid operator Red Electrica (REE.MC) and Morrocan group Nareva had joined. Another addition in early March was US company First Solar, the world's largest manufacturer of solar cells in 2009, who joined the project for an initial period of three years as an associated company.

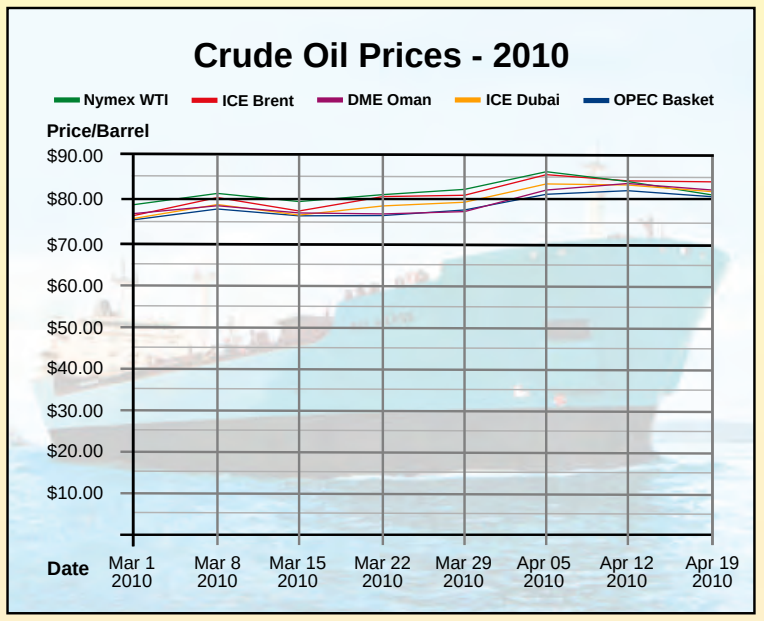
Desertec is in line with the ambitious Moroccan programme to develop its wind and solar sector, especially the 2000 MW solar project scheduled for 2020. According to the DII, Desertec could be supplying 15 per cent of Europe's electricity needs by 2050. It would also create jobs in the region and opportunities for desalination.

Umlauft says: "Technically, the project is feasible and possible today. All we need is the willingness to do it."

Oil

Crude price uncertain as economy recovers

Opec reluctant to put more oil on the market
Economic recovery driving gains in oil market



David Gregory

Throughout April and for much of March the price of West Texas Intermediate (WTI) crude oil has ranged above $80/b, surpassing the 'ideal' $70-80/b range targeted by Opec last year when prices fell below $40/b.

Despite ample supply on the market, crude prices touched $87/b in April, prompting some to point out to Opec that the price is more than what it had wished for and openly wondering what the group intends to do.

For now it appears that Opec is prepared to endure high prices, reluctant to put more oil on the market in an effort to bring the price down within the $70-80/b range. Some Opec members say that the price of crude – like the economy – remains volatile and it will take time to make a correct assessment.

With most Opec members exceeding their production targets, group compliance with self-imposed cuts agreed last December has come undone. While there has been some erosion in global inventories, crude stocks remain high in the OECD countries.

The production target for the Opec-11 (excluding Iraq) is 24.845 million b/d. During March, those members produced 26.530 million b/d, while total Opec output averaged 28.930 million b/d.

Growing confidence in the world's economic recovery is driving the gains in the oil market – plus the return of speculators. However, with crude in the range of $85/b, questions arise as to whether the high price of crude might not itself threaten the global recovery.

That has yet to prove evident and some Opec members have said it may take crude prices moving into the $90-100/b range before the group would be willing to adjust output. Kuwaiti Oil Minister Shaikh Ahmad Abdullah al-Sabah said in mid-April that prices would have to go above $100/b before Opec would take action prior to its next regular meeting, scheduled for October.

Some Opec members fear that an increase in production would only wind up in the stocks of consumer nations and provide little relief to consumers. Venezuelan Oil Minister Rafael Ramirez said that without a strong increase in demand, there would be no justification for an increase in output.

According to the latest monthly report issued by the Paris-based International Energy Agency (IEA) on April 13, global oil demand is due to rise during 2010 by 1.67 million b/d over 2009 to 86.6 million b/d – a record for oil demand. It forecast that 2009 demand will settle at 84.93 million b/d.

The non-OECD countries of China, Saudi Arabia, Russia, Brazil, Iran and India are expected to account for almost three-quarters of global oil demand growth during 2010, the IEA said.

On the supply side, the IEA noted that global supply in March fell by 220 000 b/d from the previous month to 86.6 million b/d, with Opec accounting for almost all the decline. Still, compared to two years ago, global oil supply is almost 2 million b/d higher. It also pointed out that while Opec's output in March was just below 29 million b/d, this was due to the near 10 per cent decline in Iraqi production rather than any effort by Opec members to adhere to its target production.

Meanwhile, non-Opec supply remained at 52.5 million b/d, with year-on-year output up by 900 000 b/d. The IEA said it expects non-Opec supply to average 52 million b/d during 2010, "reaffirming the more optimistic outlook amid higher prices evident since the second quarter of 2009."

In the monthly report issued by the US Energy Information Administration (EIA) forecast world oil consumption to average 85.5 million b/d in 2010 and 87.11 million b/d in 2011. It said most growth in world oil demand will take place in the Asia-Pacific and Middle East regions.

On prices, the EIA said it expects crude oil prices to average $81/b for 2010 and be at $85/b in the fourth quarter of 2011. But it added: "As always, these energy price forecasts are highly uncertain, as both recent experience and the sizable participation in near-term futures options contracts clearly demonstrate that prices can move within a wide range in a relatively short period."

Gas

Gas exporters seek price parity with crude

Although gas exporters want natural gas prices at parity with those of crude oil, they are resisting calls to cut production in order to boost prices.

Mark Goetz

Energy ministers of the Gas Exporting Countries Forum (GECF) agreed that natural gas prices should be at parity with those of crude oil during their ministerial summit in Oran, Algeria, on April 19. Gas exporters are worried about prices, particularly since the arrival of shale gas on the US market scene, but refrained from taking up a call made in March by Algerian Energy and Mines Minister Chakib Khelil that GECF members should cut production in order to reduce supply and force the price up.

Gas prices have fallen to under $4/million Btu in recent weeks, from a high of $22/million Btu when oil was selling at more than $140/b in mid-2008. For gas to be at parity with the current oil price of around $85/b, it would be selling near $14/million Btu.

Due to its nature, gas is supplied to customers under long-term contracts through pipeline or in the form of LNG. This prevents gas exporters from taking actions similar to those carried out by Opec on reducing or increasing oil production. GECF concerns are focused on low prices for LNG in the international spot market, where, theoretically, less gas could impact prices.

The participants agreed on the objective of indexing the price of gas to that of oil, but their resolve ended there, with no programme on how to achieve this.

As host of the summit and President of the GECF, Dr. Khelil read the official statement at the gathering's conclusion: "We agreed that ensuring adequate and reliable supply of gas at prices reflecting parity with oil prices and the advantages of natural gas is a challenge, taking into consideration that natural gas is an essential part of the fuel mix and plays an important role in satisfying the global need for an environmentally friendly energy source."

The proposal to reduce gas production made by Dr. Khelil prior to the conference would have required the GECF to take on more of an Opec guise and attempt to influence the gas market. The conclusions of the Oran gathering suggest that is unlikely for now. The GECF is a forum in which members exchange information on market fundamentals, projects and technical developments among other things.

However, during the course of the meeting, Dr. Khelil pointed out that the development of shale gas resources in the US is resulting in excess capacity for LNG. Prior to the technological breakthrough that led to the exploitation of shale gas, LNG producers such as Algeria, Qatar and Russia, had considered the US a prime market.

He noted that the fall in US demand for imported gas will generate "idle capacity for regasification," and added that new LNG capacity, including that due to come on-stream in Australia, "will clearly contribute to exacerbate the excess of LNG already in the market." He added that he did not expect world gas demand to rise before 2013.

GECF Secretary General Leonid Bokhanovsky said the proposal made by Dr. Khelil had not been discussed in any detail. "No practical steps on the percentage of the cuts or the segment of the cuts were discussed in the open session," said Mr Bokhanovsky, who is vice president of Russia's Stroytransgaz.

During the conference, Russia and Qatar, the world's two largest natural gas producers, announced a new strategic alliance in upstream activity. Russia has invited Qatar to participate in the development of huge gas reserves in its Yamal peninsula, where reserves are estimated at 16 trillion m^3. Qatar has in turn invited Gazprom to take part in LNG projects after it lifts the moratorium on North Field development in 2014.

Russia, Qatar and Iran hold the largest gas reserves of GECF members. The three formed a 'Troika' last year and agreed to coordinate their activities. Russia is a main supplier of pipeline gas to Europe and is developing its LNG industry. Qatar is the world's largest supplier of LNG and by the end of 2010 will have a capacity to produce 77 million tons. Iran, however, is a net importer of gas despite it having the second largest reserves after Russia. Iran's domestic policies and terms on foreign investment have stymied gas production.

Other members of the GECF include Algeria, Nigeria, Libya, Egypt, Bolivia, Trinidad & Tobago, Equatorial Guinea, and Venezuela. Together, GECF members hold about 70 per cent of the world's total gas reserves.

Costing generation options

The International Energy Agency has published its latest study on the cost of generation from various generating sources. *TEITimes* looks at the report, which for the first time includes extensive sensitivity analyses of key cost parameters that impact the cost of generation.

The International Energy Agency (IEA) recently launched its 'Projected costs of generating electricity – 2010 Edition'. The report presents the results of the main work carried out in 2009 to calculate the costs of generating base load electricity from coal, gas and nuclear plants as well as a range of renewable sources, many of which are intermittent.

The report covers 21 countries and studies technologies expected to be commissioned by 2015. For the first time, the study includes extensive sensitivity analyses of key cost parameters affecting the economics of electricity generation. It also analyses advanced technologies i.e. plants with carbon capture that might be commercial by 2020 and for the first time assumes a price for CO_2 emissions.

The study uses data from 190 power plants in Austria, Belgium, Brazil, Canada, China, Czech Republic, France, Germany, Hungary, Italy, Japan, Korea, Mexico, the Netherlands, Russia, Slovak Republic, South Africa, Sweden, Switzerland and the US.

The total sample comprises: 34 coal fired plants without carbon capture; 14 coal fired plants with carbon capture but no storage, referred to as CC(S); 27 gas fired plants; 20 nuclear plants; 18 onshore wind plants; 8 offshore wind plants, 14 hydropower plants; 17 solar photovoltaic plants; 20 combined heat and power plants using various fuels and 18 plants based on other fuels or technologies.

The study was carried out with the guidance and support of an ad hoc Expert Group of officially appointed national experts, industry experts and academics, who supplied the generation cost data to the IEA.

Calculations are based on the simple levelised average (unit) lifetime cost approach, using the discounted cash flow (DCF) method. Calculations use generic assumptions for the main technical and economic parameters agreed by the Expert Group. The most important assumptions concern the real discount rates of 5 and 10 per cent, fuel prices and a price for CO_2 emissions of $30/t.

Coal fired generation: Most coal-fired plants in OECD countries have overnight investment costs ranging between $900 and $2800/kWe for plants without carbon capture. Plants with carbon capture have an installed cost of $3223-6268/kWe. While coal prices can vary by a factor of 10 from country to country, the IEA study assumes a black coal price of $90/t except for large coal producing countries that are partly shielded from world markets such as Australia, Mexico and the US, where domestic prices were applied. For brown coal, domestic prices were applied in all cases.

With a CO_2 price of $30/t, the most important driver for coal plants without CC(S) is the cost of CO_2 in the low discount rate case. For coal plants with CC(S), the construction cost is the most important cost driver in the low discount rate case. In the high discount rate case, where total investment cost is more important, variations in the discount rate, closely followed by construction costs, are key determinants of total costs for coal plants with or without CC(S).

At a 5 per cent discount rate, levelised generation costs in OECD countries range between $54/MWh (Australia) and $120/MWh (Slovak Republic) for coal fired plants with and without capture. Generally investment costs and fuel costs each represent about 28 per cent, while operation and maintenance (O&M) represents about 9 per cent, and carbon costs around one third of the total.

At a 10 per cent discount rate, the levelised cost of generation in OECD countries is between $67/MWh (Australia) and $142/MWh (Slovak Republic) for plants with and without CC(S). Investment costs represent about 42 per cent of the total, fuel cost around 23 per cent, O&M costs about 8 per cent and carbon costs about 27 per cent of the levelised cost of electricity (LCOE).

Gas fired generation: Gas fired power plants without carbon capture in OECD countries considered have overnight construction costs of $520-1800/kWe. The cost of gas-fired plants was lower than both coal and nuclear plants in all countries considered. Gas-fired plants are also faster to build and expenditures are typically over two to three years. O&M costs are also significantly lower than coal and nuclear plants in all countries that provided data for the two or three types of plants considered. Gas prices were assumed as $10.3/million Btu in OECD Europe and $11.7/million Btu in OECD Asia. National assumptions were used for large gas producing nations such as Australia, Mexico and the US.

At a 5 per cent discount rate, LCOE from gas fired plants in OECD countries vary from $67/MWh (Australia) to $105/MWh (Italy). On average, investment cost only represents about 12 per cent of total levelised cost, while O&M cost accounts for 6 per cent and carbon costs about 12 per cent. Fuel cost represents about 70 per cent of the total levelised cost. Consequently, the assumptions for gas prices are the driving factors on the estimated levelised cost of gas-fired generation.

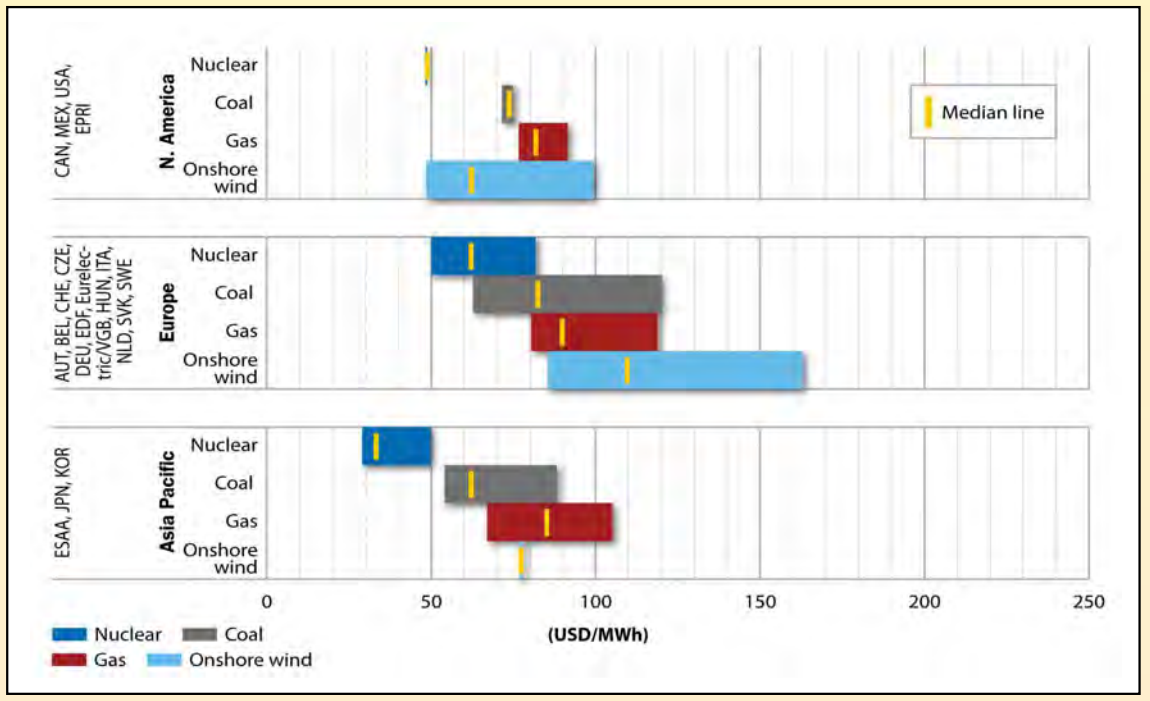
At a 10 per cent discount rate, LCOE in OECD countries varies from $76/MW (Australia) to $120/MWh (Italy). The difference between cost at a 5 per cent and 10 per cent discount rate is very limited due to their low overnight investment cost and short construction time. Fuel is the main contributing factor representing 67 per cent of total levelised generation cost. Investment cost represents about 16 per cent, while O&M and carbon each contribute about 5 per cent and 11 per cent, respectively, of total LCOE.

Nuclear power generation: Cost figures for nuclear power plants vary widely, reflecting the importance of national conditions and the lack of recent construction experience in many OECD countries.

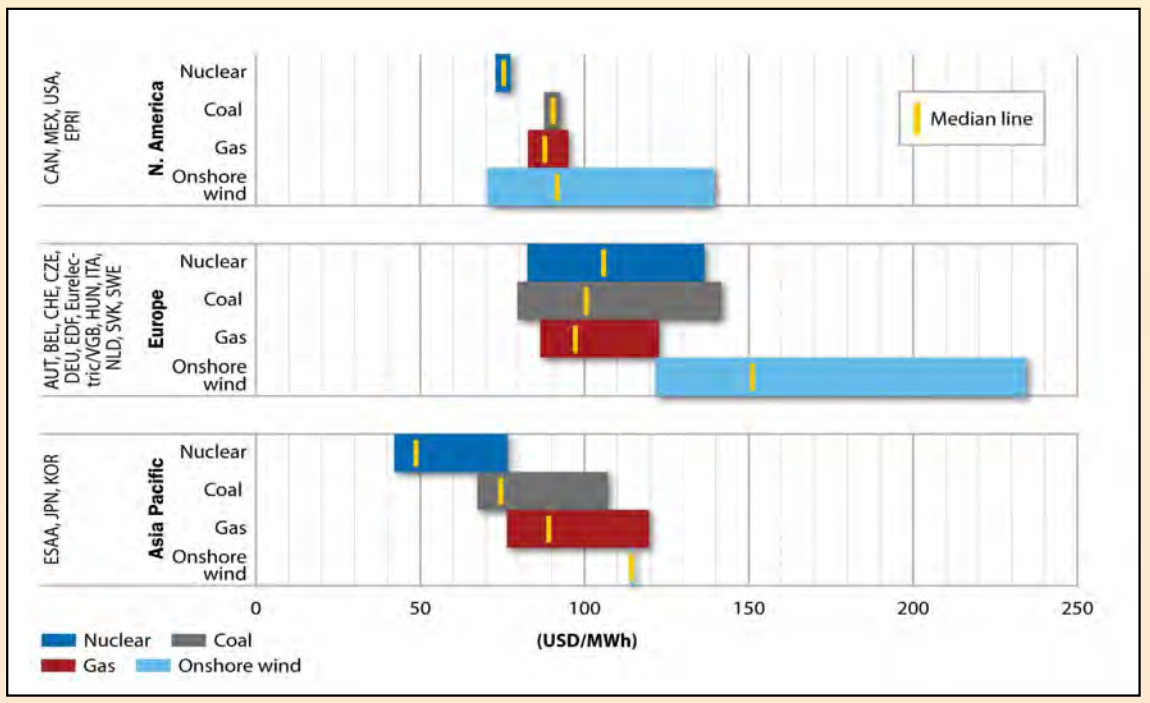
Construction costs can vary between $1600 and $5900/kWe with a median value of $4900/kWe. The study considered Generation III technology including the EPR, other advanced pressurised water reactor designs as well as advanced boiling water reactors.

At a 5 per cent discount rate, levelised cost of generation for nuclear in OECD countries are $29/MWh (Korea) to $82/MWh (Hungary). At an average of about 60 per cent, investment cost represents by far the greatest portion of total levelised cost. O&M represents about 24 per cent of the total and fuel cycle cost, around 16 per cent. These figures include cost for refurbishment, waste treatment and decommissioning after a 60-year lifetime.

At a 10 per cent discount rate, levelised cost of generation in OECD countries range from $42/MWh (Korea) to $137/MWh (Switzerland). Capital investment cost accounts for 75 per cent of total levelised cost of generation, while O&M represents 15 per cent. Fuel cycle cost contributes to 9 per cent of the total levelised cost of generation. These figures also include cost for refurbishment, waste treatment and decommissioning after 60 years.



Regional LCOE at a 5 per cent discount rate



Regional LCOE at a 10 per cent discount rate

Renewable technologies: Onshore wind farms have an overnight construction cost in the range of $1900/kWe to $3700/kWe. Construction periods are one to two years. As with the other technologies, the LCOE does not include the cost associated with integrating wind and other intermittent technologies into the grid.

The levelised costs of electricity from onshore wind and solar photovoltaic technologies are highly sensitive to load factor variation, and to a lesser extent to the construction cost, regardless of the discount rate. The reported load factors for wind power plants vary between 21 per cent and 41 per cent for onshore plants, and 34-43 per cent for offshore plants except in one case.

At a 5 per cent discount rate, levelised cost of generation for onshore wind power plants in OECD countries in the study vary between $48/MWh (USA) and $163 (Switzerland), and $101/MWh (USA) to $188/MWh (Belgium) for offshore wind plants. The cost of investment represents about 77 per cent of the total levelised cost for onshore wind turbines and 73 per cent for offshore units.

At a 10 per cent discount rate, the levelised costs of electricity from wind in OECD countries are $70/MWh (USA) to more than $234/MWh (Switzerland). For offshore wind, the costs range from $146/MWh (USA) to $261/MWh (Belgium). Investment cost represents 87 per cent for onshore wind and 80 per cent for offshore turbines. For offshore units, the difficult marine conditions imply higher O&M costs.

For solar PV plants, the reported load factors vary between 10 and 25 per cent. At the higher load factor, the levelised cost of generation reaches around $215/MWh at a discount rate of 5 per cent and about $333/MWh at a 10 per cent discount rate. With the lower load factors, the LCOE from solar plants is $600/MWh.

The two solar plants reported by Eurelectric and the US Department of Energy have load factors of 32 per cent and 24 per cent, respectively. The levelised costs range from $136/MWh to $243/MWh for the 5 per cent and 10 per cent discount rates, respectively.

The study contains limited data on the cost of hydropower generation. However, costs vary so widely, depending on plant size and site conditions, that no specific conclusions can be drawn.

If 'Projected costs of generating electricity' is any indication, the IEA says the future is likely to see healthy competition between the various generating technologies, competition that will be decided according to national preferences and local comparative advantages. At the same time, it says the margins are so small that no country will be able to insulate its choices from the competitive pressures resulting from alternative technology options.

The report concludes that no single technology will be the cheapest in all situations. The choice of a specific portfolio of generating technologies will depend on financing costs, fuel and carbon prices as well as the specific energy policy in a particular market.

This article is an extract from the executive summary of 'The Projected costs of generating electricity – 2010 Edition' by the International Energy Agency.

Powering fuel cells from coal

A research programme to develop an integrated CO_2 gasifier and fuel cell system could mean clean, efficient electricity from coal, biomass and petroleum coke in the future, **writes Junior Isles**

Finding new ways of making coal fired generation clean and efficient is at the forefront of many research and development programmes around the world. One interesting programme currently underway is a bench-scale project that aims to test the viability of gasifying coal in a CO_2 gasifier and using the fuel derived from the coal to generate electrical energy in a fuel cell. A key aspect of the technology is that the fuel cell exhausts pure CO_2, which is easier to sequester than combustion exhaust from a standard coal furnace that would contain a large amount of nitrogen.

The programme is being conducted by the Gas Technology Institute (GTI) based in Des Plaines, Illinois, USA, where Dr Ronald Stanis is the Principal Investigator for the project. He said: "Electricity from coal is a dirty process but it is cheap. We are trying to look for an alternative to getting electricity from coal, but using a clean process. In addition to being cleaner, the process would be more efficient. So the market drivers for our programme are cost, efficiency and cleanliness."

The GTI is a non-profit research and development (R&D) organisation that works primarily with natural gas companies on research. The group responsible for the CO_2 gasifier SOFC programme is called the Office of Technology and Innovation. Dr Stanis' team within this group takes part in research related to energy and the environment.

Commenting on this latest research, Dr Stanis said: "In coal combustion you have to mix coal with air which results in an exhaust gas that has air and CO_2 and other harmful SO_X and NO_X emissions. A large portion of air is nitrogen, which means that if you want to sequester the CO_2, a lot of extra energy is required. In a fuel cell system the carbon fuel, which is made in the gasification, is separated from the oxygen so the exhaust is pure CO_2. This reduces the amount of energy needed for sequestration."

The programme is currently at the research stage. The bench-scale system consists of a solid oxide fuel (SOFC) that receives CO fuel from a small gasifier.

An SOFC is a type of fuel cell that uses a solid oxide material as the electrolyte. Other fuel cells conduct positive hydrogen ions through a polymer electrolyte from the anode to the cathode. SOFCs have an anode and cathode separated by a solid ceramic electrolyte and conduct oxygen ions from the cathode (oxygen side) to the anode (fuel side). This allows the use of carbon fuels at the anode i.e. carbon reacts with oxygen at the anode to make CO_2.

Such a system, however, has not been easy to realise. "People have been trying for perhaps 20 years to make a direct coal fuel cell but feeding coal to a fuel cell is difficult because it is a solid and does not flow well. There is no ideal way of getting it to the anode," explained Dr Stanis.

Carbon monoxide can be a fuel for the fuel cell but there is no natural source of CO. Research groups, therefore, often use gasifiers to generate CO. These are typically steam gasifiers that gasify the carbon from the fossil fuel to make CO and hydrogen.

The GTI is using a gasifier that uses CO_2 instead of steam. In a reaction known as the Boudouard reaction, carbon reacts with CO_2 to make CO. At the fuel cell, the CO reacts with oxygen to produce CO_2. Dr Stanis explained the significance of this: "We are producing two molecules of CO_2 for every one molecule of carbon that we react in the gasifier. Therefore, half of the gas from the fuel cell exhaust can be recycled back to the gasifier. This means we don't need an outside source of CO_2, for example from a bottle."

The Boudouard reaction only occurs at temperatures above 500ºC. Fortunately, SOFCs operate at temperatures of 700-1000ºC. The GTI project will operate at about 800ºC. "This is a perfect temperature to use the waste heat from the fuel cell to heat the gasifier. The entire system is thermally integrated. We don't have to supply any external power or heat, or burn any coal to supply the heat for the gasifier. The gasifier pressure is also very low, which is good for the gasifier. It operates a little above atmospheric pressure, perhaps 5-10 psia to maintain flow – SOFCs don't need high pressures to operate. This is really an ideal system for generating electricity from coal," says Dr Stanis.

A hydrogen-fuelled fuel cell operating at 800ºC has a maximum theoretical efficiency of 76 per cent. According to Dr Stanis, this decreases to 67 per cent when running on CO. During operation, he said this might be less than 50 per cent. "This efficiency is fine since the other 50 per cent is heat, which is used for the gasifier. In fact we only need 30 per cent as heat for the gasifier."

The concept was first proven with pure carbon since it only produces CO. It has also been proven with coal, wood, petroleum coke, which also produce hydrogen and other hydrocarbons. So far the bench-scale tests have been small, using fuel cells of 1 W power output.

The programme, supported by the Illinois Clean Coal Institute (ICCI), began in the autumn of 2008. Phase 1, the proof-of-concept, ran until the spring of 2009. The second phase, supported by funding of $150 000 from the ICCI, started in January this year and will run for one year. This phase will see the size of the fuel cell scaled up to about 10 W.

The main goal of the current phase is to test the stability. Dr Stanis explained: "If you feed a hydrocarbon fuel or carbon to a solid oxide fuel cell, you will get carbon deposition on the anode. The reverse Boudouard reaction happens at the anode, where CO will deposit carbon and generate CO_2. The equilibrium of the reaction all depends on temperature. At high temperature it favours CO; at low temperatures it favours carbon and CO_2.

Dr Stanis explains: "Carbon deposition causes losses. It is reversible but the aim is to operate at a steady-state condition to avoid a non-hazardous condition for the fuel cell anode. Right now we are working at adjusting the equilibrium of the gasifier temperature and the fuel cell temperature to avoid carbon deposition."

In an integrated operating system, the fuel cell temperature will always be higher than the gasifier, which, according to Dr Stanis, should be safe for the fuel cell anode. "We are looking at what is really safe for the anode and what is the safe ratio of CO to CO_2 at an anode using existing nickel oxide anode materials." While other research groups have explored the use of alternative carbon-tolerant anode materials, the goal of Dr Stanis' team in this phase is to use commercially available fuel cell anodes.

Dr Stanis says they know the safe concentration levels of CO and CO_2 that can be fed to the SOFC to avoid anode poisoning and have found the operating windows that are safe for anode stability. He added: "Right now we are in the process of scaling up to a fuel cell of a couple watts. We are also moving to a larger gasifier to demonstrate that with a larger gasifier operating at a certain temperature, you can still achieve long-term stability at the fuel cell at a given temperature."

The gasifier that is currently being assembled will hold 3 kg of carbon, compared to the previous gasifier, which held perhaps 5 g of carbon for quickly testing individual samples. The larger size gasifier will allow a long term, 1000 hr stability test.

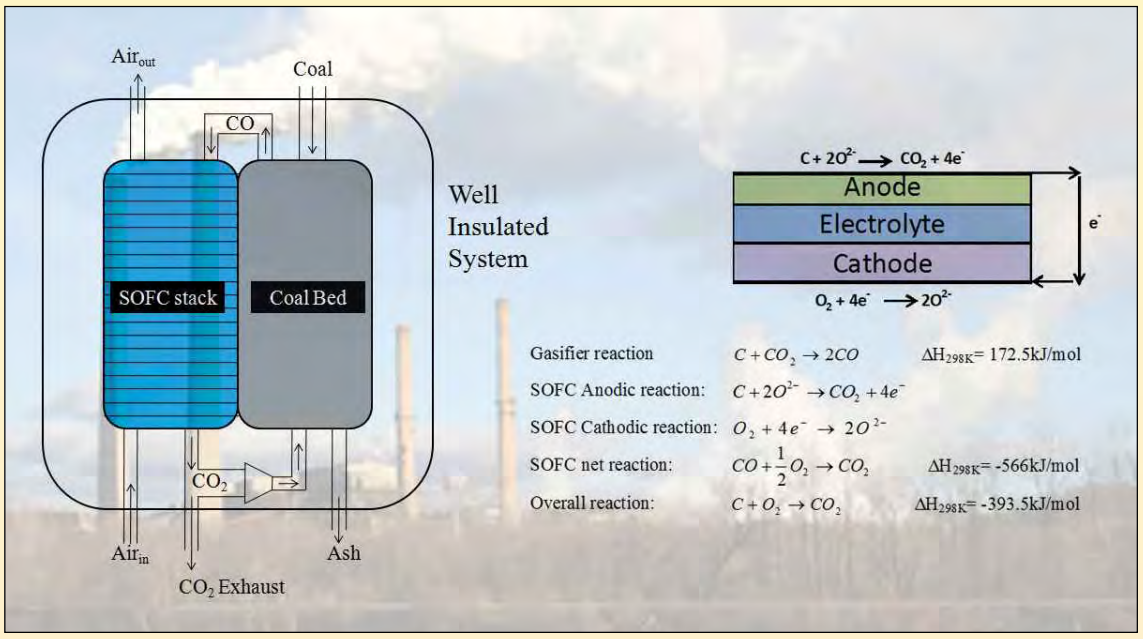
Once this second phase concludes at the end of the year, there is the possibility of a larger pilot scale project. This may see the involvement of industry in order to secure a larger funding award.

Dr Stanis sees the main challenges to scale-up being the integration of the system and the necessary balance-of-plant equipment. "We will need a compressor that can operate at considerable temperature to recycle CO_2 back to the gasifier. As a thermally integrated system, the size of the gasifier and SOFC will have to be correct to ensure there is enough waste heat. There shouldn't be too many scale-up challenges but if we can't get the equilibrium we need, we will need alternative anode materials. We would probably have to work with a partner on that."

Such a pilot system could be perhaps two years away. Looking further ahead, it could be another two years before there is a large-scale demonstration project with a real user.

The ideal customers are coal-based utilities, particularly those that have been mandated to cut emissions. It could also be used by petroleum companies to generate electricity from waste petroleum coke. Dr Stanis speculates that it could also be used on a much smaller scale, for example by homes using bio-waste to generate electricity. Although a good idea, Dr Stanis agreed this could be too expensive.

The high cost of fuel cells has always been the hurdle to commercial deployment. As Dr Stanis put it: "If fuel cells were cheap, we would have them everywhere. There are cost issues but some companies think that costs will come down with increased production."



Carbon monoxide can be a fuel for the fuel cell but there is no natural source of CO. Research groups therefore often use gasifiers to generate CO. The GTI is using a gasifier that uses CO_2 instead of steam for gasification

Junior Isles

Getting your hands on the green

Perhaps GE should stand for 'Green Energy' instead of General Electric. And perhaps I should have been in marketing.

Ricardo Cordoba, GE Officer and President of GE Energy for Western Europe and North Africa says there is a saying at the company: "green is green", meaning that green products make green money. Cordoba, speaking at the first annual 'European Regions Energy Day' meeting in Brussels, was giving his view on why we should make energy greener.

After explaining the merits of increasing efficiency, Cordoba was challenged as to why GE would be interested in energy efficiency when there is surely more money to be made in clinching lucrative deals for selling big plant equipment to power generators.

"GE is in many businesses. We invest $1.5 billion a year on research and development for green products. There are big opportunities in increasing efficiency. Every 1 per cent increase in efficiency means a 2 per cent reduction in CO_2 emissions."

Last summer GE Energy formed a partnership with the Assembly of European Regions (AER) with the goal of creating a gateway between energy experts and regional public decision makers. The partnership's aim is to examine the energy challenges facing European regions and to promote possible solutions.

AER is the largest independent network of regions in wider Europe. Bringing together more than 270 regions from 33 countries and 16 inter-regional organisations, it is the political voice of its members and a forum for inter-regional co-operation.

The ethos behind the AER when it comes to clean energy, is that the regions have an important role to play in meeting climate change targets since it is they that will be implementing the projects.

Speaking on the sidelines of the conference, Klaus Klipp, Secretary General of the AER said: "The EC realises that without the regions, progress will be slower."

The European Commission acknowledges this view. In his conference address, Fabrizio Barbaso, Deputy Director General for Energy, EC, DG for Energy said: "We have to be frank, our expectations of Copenhagen were not fulfilled. But whatever happens at the global level, the EU will only achieve a low carbon energy future if our cities, where 80 per cent of our people live and work, are low carbon. The key to success will be the active involvement and commitment of local actors with local know-how and local initiatives."

Barbaso added that the interplay between European, national and local decision makers is complex but in the European Union, "there is a well-established framework in which the regions can work together to tackle today's challenges effectively".

Unfortunately, the "complex interplay" may be a little too complex. Certainly the EC has well-established frameworks and many directives aimed at promoting clean energy in the community but the result is a maze of bureaucracy that has left regions either unable or unwilling to access EU money that has been set aside under the European Regional Development Fund (ERDF).

> There is a complex interplay between the European, national and local decision makers

According to the EC, European regional policy is designed to bring about concrete results, furthering economic and social cohesion to reduce the gap between the development levels of the various regions.

Renewable energy activities have been identified as having a large potential to foster the economic development in the EU regions, creating new jobs and giving new economic and social development impetus.

In the framework programmes for 2007-2013 under the EDRF, EU allocations of €4.8 billion have been made for projects in renewable energies (wind, solar, biomass, hydroelectric and geothermal) and €4.2 billion for energy efficiency, co-generation and energy management.

It emerged in the conference, however, that the regions have only made use of three per cent of the funds set aside for renewable and energy efficiency projects.

Mr Klipp explained: "Procedures are very complex and each [EC] DG has its own rules. To get money out of the EU is a rather complicated process. The poorer the region, the more difficult it is for them to get their money."

The AER is hoping to act as the bridge between the EC and local enterprises by informing its members of calls for projects and educating them on funding procedures.

Luc Bas, head of government relations, Europe, of The Climate Group said: "Newer EU countries such as Hungary and Bulgaria are becoming more devolved but they are not at the level of a German state, for example. The regions in Eastern Europe are fairly close to non-existent institutionally. You can do projects there but they themselves don't have the institutional capacity to deal with the issues. This is where region-region cooperation is really vital."

With discussions beginning for a new EU funding period that will start in 2014, Klipp is concerned about what the lack of transfer of funding from EU to the local enterprises might mean. "Some at the EC believe a big fund should be set aside for energy investment but we don't like this [idea]. This would again mean centralistic management, which would slow down the whole process. We think it should stay as it is i.e. as a so-called regional policy."

Yet Klipp remains positive: "In terms of energy, the funding from the EU is only a small portion of what is needed in relation to climate change. I don't think the EU could fund everything, their budget is not big enough but it is important since it can trigger innovative projects and gets things moving. But even without EU money, there is still investment in energy infrastructure."

Mr Bas also praised achievements at the regional level. "In many cases, what they achieve at the regional level is incredible. They go further than the national governments and act even in the absence of a national agreement," he said.

It is hoped that this determination shown at the regional grass roots level can travel up to the national, EU, and ultimately, global level.

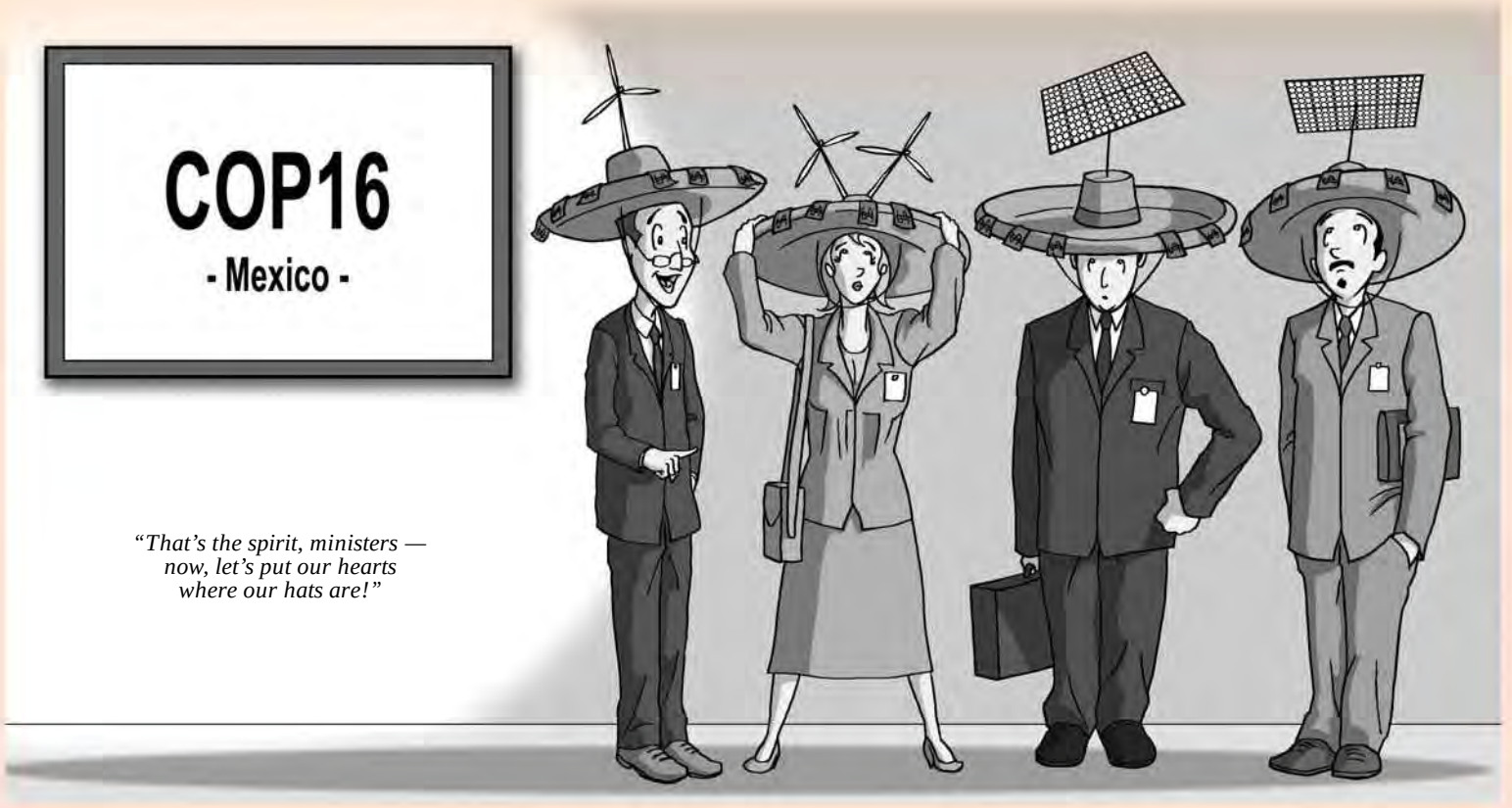
Klipp said: "Ahead of COP16, the AER is working with The Climate Group to put pressure on the negotiators that will be in Mexico, so they realise that implementation is happening at the regional level. It is not enough to just set goals, they have to be always thinking that these goals need to be turned into reality."

If the will is there, there is no end as to what can be achieved. In what turned out to be an amusing presentation from a rather colourful Ms Eva Hallström, delegates were told of activities that are ongoing in the Swedish county of Jönköping.

Ms Hallström, who is the Energy and Climate Coordinator of the County Administrative board of Jönköping, explained that Sweden has no regional energy office. However, through more than 4500 energy efficiency initiatives it has managed to keep energy demand flat between 1980 and 2006 despite a steady growth in GDP. "By 2020 we will reduce energy use in Jönköping county by 30 per cent compared to 2007," she said. Ms Hallström herself is using solar energy to heat her home and also spoke of a small-medium company that is rolling out charging network for electric vehicles.

A fellow speaker asked Ms Hallström: "How do you manage to have so many energy initiatives without an energy agency?" The response was interesting. "I don't know," said Ms Hallström. "We are all interested, so we want to move ahead. We don't want to just investigate, we want to do things… we think we can do even bigger projects with support from the EU."

So although getting your hands on the green is important, it is more important to act green rather than just talk green. The EU and global climate change negotiators in Mexico should take a leaf from Ms Hallström and the citizens of Jönköping.



"That's the spirit, ministers — now, let's put our hearts where our hats are!"