What if Cancun can't?
Ministers are already considering the prospect of failure in Cancun. Page 2

The shale gale
Will shale gas be the global game changer that many are claiming? Page 14

Final Word
Junior Isles explores the process of natural selection. Page 16

November 2010 • Volume 3 • No 9 • Published monthly • ISSN 1757-7365 www.teitimes.com

THE ENERGY INDUSTRY TIMES

IN BRIEF

Banking on China
Reliance Power's record order with Shanghai Electric highlights the increasing role of Chinese manufacturers in the global power market.
Page 6

UK preserves energy spending
The UK's energy industry has largely survived a round of severe government spending cuts.
Page 8

Industry Perspective: Beyond baseload bias
Redpoint Energy explains why investors need to rethink the way that generation assets are valued and financed.
Page 12

Technology: A superconducting 'SuperStation'
Tres Amigas gradually takes shape.
Page 15

UK ambitions for CCS leadership under threat

Uncertainty surrounding funding for the UK's competition to build up to four carbon capture and storage projects is threatening the country's ambitions to be a global leader in the technology, **says Junior Isles**

Chris Huhne: won a battle to secure £1bn from the Treasury

The UK's ambition to become a global leader in carbon capture and storage technology is being jeopardised by a lack of certainty on funding and the slow progress of its competition to build projects to demonstrate carbon capture and storage on power plants.

Ongoing uncertainty has seen the withdrawal of all but one of several projects that were originally on the table.

As part of its Comprehensive Spending Review, last month the energy secretary, Chris Huhne, won a battle to secure £1bn from the Treasury to pay for the development of CCS demonstration technology. Although it is only half of that committed under the previous Labour government, the new coalition government argues that it demonstrates its continued commitment to being the "greenest government the country has ever seen".

Speaking at the European Future Energy Summit, Huhne said: "Inevitably, there will be some sacrifices. We cannot afford to fund everything we want to fund. But over the coming weeks, you will see clearly the government's commitment to a low-carbon economy." While the government has reiterated its commitment to fund a further three demonstration projects, there is no detail as to the amount of funding or where it will come from. DECC says it will set out proposals on how demonstration projects 2-4 will be taken forward by the end of the year.

It had previously been understood that there would be a separate CCS levy to fund the CCS demonstration projects.

However the government says it will now re-consult on the proposal for a levy. As part of the Review, the government said that it will take decisions on the funding mechanism for the additional projects, i.e. whether through a specific CCS levy or through general public expenditure, following completion of work in Spring 2011, on the reform of the Climate Change Levy to provide support to the carbon price.

Professor Jim Skea, Research Director at the UK Energy Research Centre commented: "The £1 billion announced is obviously very welcome but there will need to be further approaches… The climate change committee has argued that we will need all four of these projects if we are going to have a credible step moving forward."

A consortium led by Iberdrola's UK subsidiary Scottish Power is now the only remaining participant in the competition.

BP was among the first to withdraw in November 2008 saying it could not find a partner with relevant coal-fired experience. Previously, it had abandoned a similar demonstration project in Peterhead, Scotland because of a lack of government support.

Then last November saw the withdrawal of the consortium of Peel Energy, DONG Energy and RWE npower. Peel Energy, hinted that the reason was that the process was moving too slowly.

Although ruled out of the UK competition in 2008 when the government decided to focus on post-combustion capture, last month Powerfuel plc said it was putting its Hatfield gasification project with CCS on hold until the government clarified its position on the CCS levy.

The competition suffered another blow later that month when E.On pulled out. It said in a statement that the economic conditions were still "not right" for the company to progress its Kingsnorth coal fired plant in Kent and that it could not meet the timetable for the CCS competition.

"Having postponed Kingsnorth last year, it has become clear that the economic conditions are still not right for us to progress

Continued on page 2

THE ENERGY INDUSTRY TIMES is published by Man in Black Media — www.mibmedia.com — Editor-in-Chief: Junior Isles — Creative Director: Jerome Hinds — For all enquiries email: enquiries@teitimes.com

(Continued from page 1)

the project and so, simply put, we have no power station on which to build a CCS demonstration," E.On UK Chief Executive Paul Golby said.

Commenting on being the sole survivor left in the competition, Roger Seshan, Commercial Development Director at Scottish Power said: "We are delighted the government has re-affirmed its commitment to making the UK a world leader in CCS. The decision will enable the Scottish Power consortium to maintain its leadership position. Our project at Longannet, at 300 MW, is the largest project that is being discussed."

Seshan believes it is important that the UK is at the forefront of global CCS development. Quoting former Shadow Secretary of State for Energy, Charles Henry, Seshan said that Britain stands to gain £3 billion per year from the global CCS market by 2020 by retaining its existing power industry combined with new business opportunities from the supply chain and associated services for CCS. This figure could double to £6 billion by 2030 and help create and sustain 100 000 high-value jobs.

"This is why CCS was successful in getting through the Comprehensive Spending Review," said Seshan.

The European Commission also welcomed the UK's commitment to CCS. Simon Bennett, Programme Manager, CCS Project Network at the EC told *TEITimes* on the sidelines of the EFEF: "While we cannot dictate what member states dedicate to CCS development, the £1 billion funding is a welcome move."

When it was first announced, the UK competition planned to focus on post-combustion capture technology due to its ability to be retrofitted to existing plants not just in the UK but also abroad in countries like India and China that rely heavily on coal fired generation.

Experts have been calling for more cooperation between China and other nations in developing CCS technologies and many have noted the growing enthusiasm of China's government and the energy industry towards the technology.

In August the state-owned Shenhua Coal Liquefaction and Chemical Company began building China's first CCS industrial model programme in Erdos, Inner Mongolia Autonomous Region.

The EU is keen to lead the global development of CCS and plans to provide funding to have 12 projects running by 2015.

While the EU may currently lead the race to be the first have a demonstration plant up and running, other initiatives are making good progress. The Australian government-backed Global Carbon Capture and Storage Institute (GCCSI) last month announced funding of around A$18 million for six projects.

The projects in Australia, the US, Romania and the Netherlands were chosen from a pool of over 50 submissions under the first round of applications to the Canberra-based GCCSI.

World must not wait for climate deal

With the diminishing prospect of reaching a global climate deal in Cancun, some are saying the energy industry must press ahead with efforts to cut its carbon footprint regardless of the outcome of the upcoming climate negotiations.

Junior Isles

Lykke Friis: we will not be able to produce a 'hole-in-one'

Slow progress in talks during the run up to the COP16 climate change talks in Cancún, Mexico, which start at the end of this month, indicate that there is unlikely to be any legally binding global agreement.

Limited progress at the UN climate talks in Tianjin, China, in early October has raised fears that the Cancun negotiations starting on 29 November could repeat the failure of last year's Copenhagen meeting – putting the future of the international climate regime in doubt.

The UN climate change secretariat, however, put a positive spin on the Tianjin talks. UN Executive secretary Christiana Figueres commented that the talks had "got us closer to a structured set of decisions that can be agreed in Cancún". She added: "Governments addressed what is doable in Cancún, and what may have to be left to later."

The Tianjin meeting concluded with the publication of a series of "draft decisions" that will form the basis of talks in Mexico, both under the Kyoto Protocol stream of the negotiations, and the Long-term Cooperative Action stream, which includes the US, which is not a signatory to the protocol.

Meanwhile, speaking at the Reuters Global Climate and Alternative Energy Summit, climate commissioner Connie Hedegaard said: "If Cancún is a big disappointment, achieving nothing or not much, then I think a lot of governments around the world will start to say: 'What comes out of this process?'"

But regardless of the outcome of Cancún, some government ministers argue that the world must not wait for a global agreement in order to take action on climate change.

At the recent European Future Energy Forum in London, Lykke Friis, Denmark's Minister for Climate Change and Energy said: "I wish I could say 'Cancún can' as a new slogan, but we will not be able to produce a 'hole-in-one' i.e. a legally binding global agreement… but we mustn't put all our eggs in one basket by waiting for a climate deal."

The main issue in Cancún that is likely to prevent a global deal is the ongoing dispute between developed and developing countries – particularly the US and China.

The head of the US delegation in Tianjin, Jonathan Pershing, said there has been some progress on issues like financing, technology transfer and forests.

However, other issues remain unresolved. "In particular, we're disappointed that we made very little progress on the key issue that confronts us – how to reflect our commitments and actions, and agree on the provisions on reporting to each other on those commitments and actions," Pershing said.

Pershing said the United States and China work well together on climate change, but he acknowledged that the two countries have disagreements in global settings.

In a speech in the US in early October, American climate change envoy Todd Stern said Beijing could not insist rich nations take on fixed targets to cut greenhouse gas emissions while China and other big emerging nations adopt only voluntary domestic goals.

The head of the Chinese delegation, Su Wei, criticised Stern's comments as an attempt to blame China and other developing countries.

EDF battles to keep Calvert Cliffs alive

- Constellation withdraws from project
- EDF buys all UniStar interest

The sudden withdrawal of EDF's US partner Constellation Energy from the Calvert Cliffs 3 project in Maryland has not only put the nuclear project in danger but has stalled the French energy company's US nuclear ambitions.

Federal law prohibits full ownership or control of a US nuclear plant by a foreign entity. In the latest move to save the project, EDF has therefore bought out Constellation's interest in UniStar, the companies' 50:50 nuclear development venture, for $140 million. EDF hopes that the purchase of the stake now leaves it clear to seek another US partner to replace Constellation.

The deal reduces EDF's stake in Constellation from 8.4 per cent to 6.7 per cent. EDF also gets sites for four possible new nuclear plants: two at Calvert Cliffs and two in New York state.

Crucially, the deal resolves the dispute between the companies over a put option that gave the US company the right to sell 12 non-nuclear power plants to the French company for up to $2 billion, a price that analysts say could be $1 billion more than the plants are worth. The option was part of a deal struck two years ago when EDF bought nearly half of Constellation's existing nuclear plants for $4.5 billion to rescue it from a financial crisis.

Constellation had championed the proposed third reactor at Calvert Cliffs as an early step in a US nuclear renaissance and joined with EDF, the world's largest owner of nuclear power plants, to create UniStar in 2007.

EDF is trying to establish a foothold in the US in order to sell French EPR reactors developed by Areva into the market. Calvert Cliffs 3 was seen as the launch pad but Constellation pulled out of negotiations with Obama administration officials in early October over a federal loan guarantee deemed crucial to the $9.6 billion project.

In abandoning negotiations for the loan guarantee, Constellation said the $880 million cost of obtaining the $7.5 billion guarantee was too high and other terms offered by Washington were too expensive and burdensome. EDF said it was shocked by what it called Constellation's unilateral decision.

Disappointed officials, including Gov. Martin O'Malley and House Majority Leader Steny H. Hoyer of Maryland, said they would work to revive the project.

Clean-tech investment returns in 2010

Information provider Bloomberg New Energy Finance (BNEF) said global investment in clean energy hit $37.9 billion in the third quarter, as a flood of cash into offshore wind infrastructure in the North Sea helped drive a record $32.8 billion in asset financing.

Michael Liebreich, BNEF chief executive said clean energy investment in 2010 revealed hot spots and cold spots. "The latest hot spot is infrastructure spending for North Sea offshore wind," he noted.

BNEF said China's $13.5 billion in asset financing was an all-time high but the US market remained relatively subdued, with just $4.4 billion of clean energy project financing, down from $5.1 billion in the second quarter. BNEF cited low natural gas prices, which make it hard for renewable energy developers to negotiate attractive power purchase agreements.

The headline figure from BNEF was up 11.5 per cent year-on-year and 12 per cent on last quarter's $33.9 billion. But it masked a slump in venture capital and private equity investment in the sector, which fell 39.6 per cent to $1.4 billion in the third quarter.

The preliminary third quarter report released by Cleantech Group and Deloitte, predicts 2010 will be the second highest year on record for investment, after the boom year of 2008.

However, it said global venture capital investment in clean technology in July to September fell 30 per cent from the previous quarter, as economic recovery doubts resurfaced and the solar sector faltered. Venture capitalists invested $1.53 billion across 152 deals, down 30 per cent from the $2.18 billion posted in the second quarter and a drop of 11 per cent from $1.71 billion in the third quarter of 2009.

The report pointed to a "notable" drop in solar investments compared to earlier in 2010.

While North America accounted for 61 per cent of total venture capital investment, the third quarter $928 million investment in the region represents a 42 per cent drop from the previous quarter.

By contrast, there was a "stark jump" in clean-tech venture capital investment in China, accounting for 10 per cent of the total, with $153 million across 11 deals. For the same period last year, China made up just 2 per cent of total global clean-tech venture investment.

The only good watt is a negawatt

Due to intrinsic inefficiencies 1 kWh consumed at the point of use requires 3 kWh of primary energy created at the power plant.

What's a negawatt? The one you didn't use.

Energy saved is money saved.

Yes, the smart grid is coming, and we can all look forward to the innovations it will bring. But can we really afford to wait? We need a solution that will save us energy today while we get ready for the smart grid tomorrow.

Introducing EcoStruxure™: Active Energy Management™ architecture from Power Plant to Plug™

EcoStruxure solutions from Schneider Electric™ can reduce your energy use by up to 30% right now. End-use efficiency is where our focus needs to be! The percentage of revenue spent on energy by companies could reach 30% by 2020. And there is an urgent need to reduce CO_2 emissions, especially as energy demand escalates. Energy management is the key – the fastest and most effective solution to curb greenhouse gas emissions while improving business performance. In fact, by 2030, energy efficiency and behaviour change will offset more CO_2 than all the new wind, solar, and alternative energy generation methods combined.*

EcoStruxure™

EcoStruxure solutions cut energy costs today

As energy prices continue to climb, every kWh of energy you save matters. One kWh not consumed at your plug also means 3 kWh of primary energy not needed. Today, only EcoStruxure Active Energy Management architecture can deliver up to 30% energy savings across your buildings, industrial plants, and data centres. You deserve an Efficient Enterprise™!

Get smarter about energy.

Receive our FREE white paper, 'Growing a Green Corporation'.

Visit www.SEreply.com Key Code 82576t
Call +1 401-398-8560 (For calls outside of the US)
or 800-789-7038 (toll free)

Schneider Electric™

Shale gas reshapes US energy industry

A global natural gas glut that has resulted in low gas prices, combined with the growing US shale gas industry, is seeing a return to gas fired generation at the expense of coal.

Siân Crampsie

The US natural gas sector is booming and low prices are helping to drive plans for the development of new natural gas fired generating capacity.

Washington-based utility Energy Northwest is considering plans to build a $400 million gas fired power plant at the Port of Kalama, while Mirant recently announced that it has closed financing on a 760 MW natural gas fired peaking facility in California.

Natural gas currently accounts for around 21 per cent of electricity generation in the USA, but this is expected to rise to 25 per cent by 2015 – largely at the expense of coal.

The boom is the result of major new gas discoveries in the USA – particularly in shale formations that were previously thought uneconomic to drill.

Technological advances have, however, made those resources accessible and several major shale gas fields have started production in the last few years.

Natural gas, which had traded at about $2 per million British thermal units in the 1990s, hit nearly $15 in 2005. It is now trading at about $3.50, driven by reduced industrial demand and an oversupply in the market.

"The magnitude of the US shale gas resource is extraordinary," commented Robert Clarke, Unconventional Gas Research Manager for Wood Mackenzie, which says that US shale gas reserves have become a world-scale source of secure long-term gas supply.

"The key factor driving this has been the continued evolution and application of new technologies to unlock enormous volumes that were previously considered uncommercial," said Luke Parker, Manager of Wood Mackenzie's M&A research service. The result is lowered development breakeven costs to a level at which the cost of shale gas is highly competitive with other domestic sources of supply – conventional and unconventional – and LNG imports.

Operators have made, and continue to make, notable advances and unit costs have fallen in spite of increasingly complex and specialised well design, says Wood Mackenzie.

The oversupply in the natural gas market is now driving structural change. According to Wood Mackenzie's latest corporate analysis, upstream mergers and acquisitions (M&A) expenditure in US shale gas totalled $21 billion during the first half of 2010 – equivalent to one third of global upstream M&A spend during the period.

In October Chinese firm Cnooc agreed to pay just over $1 billion for a 33 per cent stake in Chesapeake Energy's Eagle Ford shale acreage in Texas. The deal came a day after Statoil and Talisman Energy of Canada joined in a $1.3 billion deal to buy Texas shale gas properties from Enduring Resources.

The level of M&A is expected to continue over the next few years, says Wood Mackenzie. "The ingredients required for continued high levels of M&A activity in US shale gas remain in place," said Parker. "The drivers that make shale gas so attractive – world scale resource, robust economics, access opportunities and limited above-ground risk – are as strong as ever."

Continued low gas prices and new clean air legislation has put US coal fired generation under pressure. However, recently proposed legislation would give a boost to the USA's coal sector

Under new legislation introduced to the US Senate last month, electricity from coal-fired power plants fitted with carbon capture and storage (CCS) technology could be classed as clean energy.

Senator Lindsey Graham (R-S.C.) has introduced the Clean Energy Standard Act of 2010, which would require utilities to obtain 13 per cent of their energy from clean sources by 2013, increasing to 20 per cent by 2020 and continuing to rise by five per cent every five years through 2050.

Utility sector executives have warned that the price of electricity will rise in coming years if coal fired power plants are forced to shut down.

Under the Clean Energy Standard Act of 2010, sources included in the definition of "clean energy" would be renewable energy, biomass, new nuclear, and coal-fired power plants, provided that 65 per cent of their greenhouse gas emissions are captured and stored.

The legislation would also credit companies retiring inefficient fossil fuel plants and allow utilities to pay 3.5 cents/kWh in lieu of compliance.

According to Duke Energy Corp. CEO Jim Rogers, around one-third of US coal-fired power plants will close by 2020. Speaking at a conference on the US-China relationship on energy policies, Rogers said that regulations expected to come over the next four to five years via the Environmental Protection Agency (EPA) will contribute to the plant closures.

Ontario green scheme proves controversial

Measures taken by Canada's Ontario government to green its economy have been praised by environmental groups but come under fire for trade restrictions placed on companies from outside the province.

The Green Energy Act Alliance has applauded an announcement by the Ontario government that it is to shut down four coal fired units in the province.

The closure of two of eight units at the Nanticoke plant and two of four units at the Lambton plant are part of Ontario's plan to phase out dirty coal fired generation by 2014 and replace it with wind, solar and other cleaner energy sources.

Ontario has added more than 8000 MW of clean generating capacity since 2003, and its government says that a coal-free province will reduce air pollution and healthcare costs.

The scheme is the single largest effort to reduce climate change in Canada.

But some of Canada's largest trading partners have complained to the World Trade Organisation (WTO) about domestic content requirements for renewable energy projects.

Japan, the European Union and the USA say that the policy violates international trade agreements because they favour Ontario-made equipment. The policy is designed to attract manufacturing to the province and boost employment.

An alliance of solar photovoltaic manufacturers including First Solar, Mitsubishi Electric Sales Canada, Sanyo Canada and Timminco recently released a research study that indicated that Ontario's domestic content provisions would result in increased costs for solar energy projects and would have a negative impact on employment.

Ontario's Green Energy Act received royal assent in May 2009. The legislation is designed to boost investment in renewable energy, create green jobs and stimulate economic growth.

FutureGen seeks storage site

The FutureGen Industrial Alliance says that it is working with its project partners on an "aggressive timeline" to bring the USA's first coal fired, near-zero emissions power plant on-line.

The Alliance has started the search for a permanent storage site in Illinois that will store carbon dioxide (CO_2) from the proposed FutureGen 2.0 plant. The move came just weeks after the Alliance signed an agreement with the US Department of Energy (DOE) giving it a major role in the FutureGen project.

FutureGen involves the repowering of an Ameren Energy Resources power plant in Meredosia, Illinois, with an oxy-combustion plant equipped with carbon capture and storage (CCS) technology. It is being supported with $1 billion of funds from the US Recovery Act.

The release of the site selection guidelines for the CO_2 storage site will be followed by a request for proposals, and the Alliance is expecting to announce a site in early 2011.

The storage site will be used to permanently sequester 1.3 million metric tonnes of CO_2 per year from the FutureGen 2.0 project for at least 30 years, and also needs to be capable of accepting CO_2 from other power and industrial sources in the future.

In September the Alliance signed an agreement with the DOE that makes it responsible for the construction and operation of the storage site and the pipeline connecting it to the FutureGen plant.

Russia agrees to build Venezuelan reactor

Venezuela is planning to reduce its dependence on hydropower and fossil fuels through the development of a nuclear energy sector.

The South American country – which has been suffering from severe power shortages – has reached a deal with Russia over the construction of nuclear capacity.

The agreement is the latest move by Venezuela to tap its international allies for expertise and equipment to boost its energy sector. It has also raised alarm bells in the USA, where there are concerns over the developing relationship between Venezuela, Russia and Iran.

Under the agreement, Russia will build a two-unit nuclear power plant, plus a small research reactor. A timeline for the project is not clear.

Reliance banks on China

A record order for Chinese power generation equipment placed by India's Reliance Power highlights the growing relationship between the two countries and underlines the increasing role of Chinese manufacturers in the global power market. **Syed Ali**

Reliance Power's recent $8.3 billion order for power generation equipment from Shanghai Electric Group is one of the biggest contracts ever signed between India and China, highlighting the growing trade relationship between the two countries.

When combined with a previously delivered order, the overall contract between the two companies is valued at $10 billion. The deal, financed by the Export-Import Bank of China and other Chinese banks, will see Shanghai Electric deliver 30 000 MW of coal fired generating capacity over the next three years. It includes 42 power generation units of 660 MW, six of which have already been delivered.

Anil Ambani, chairman of Reliance ADA said that the deal was "the largest order in the history of the power sector… and the largest single business relationship between India and China".

He added: "This is not just about selling equipment." Ambani sees it as a strategic partnership under which Shanghai Electric will also provide spare parts, service and training, and may manufacture in India.

Zheng Jianhua, president of Shanghai Electric said his company was in the final stages of determining "where, how and when" it will enter the Indian market for manufacturing.

Ambani noted that Indian manufacturers of power equipment are fully sold out until 2015. "The scale and complexity of what we wanted to achieve was only possible through global sourcing," he said.

Reliance also placed an equipment order for what will be the country's largest gas fired combined cycle plant.

Under contracts totalling over $750 million, GE will supply six Frame 9FA gas turbines, three D-11 steam turbines, training and long-term services for a 2400 MW expansion of the Samalkot power plant in the state of Andhra Pradesh.

The new plant is expected to enter simple cycle operation in the first half of 2012 and full combined cycle operation in the second half of that year.

Meanwhile, Reliance has come under fire over its Sasan power project. The project will see Reliance construct a major coal mine, with part of the output to be consumed by a sister coal-fired power plant with a capacity of nearly 4000 MW and annual emissions of 26.4 million tonnes of carbon dioxide.

The US Export-Import Bank had originally rejected a request to provide $917 million in financing for the project on the basis that it failed to pass the export credit agency's pioneering carbon policy.

Ex-Im has now rethought its decision because of promises by Reliance to install 250 MW in a separate renewables development. However, Doug Norlen, a campaigner with NGO Pacific Environment, said the memorandum of understanding turned over under a Freedom of Information request filed by Friends of the Earth undermines arguments that Ex-Im used its backing to leverage the renewables deal.

"It talks about current investment already under way – nothing new that is leveraged by Ex-Im's financing of Sasan," Norlen said.

Pacific Environment says that the export credit agency's carbon policy is fatally undermined because it failed to screen out an investment in Sasan.

"They're desperate to put a positive spin on financing one of the most harmful power projects in the world," Norlen argued.

Anil Ambani: forced to source globally

Thailand attracts green technology investment

EDF considers more CDM projects
ADB loan for solar plants

Thailand improved its green credentials with recent announcements that will see it boost its electricity generation from renewables.

EDF Trading, one of the world's top three carbon credit buyers, is considering up to six more projects in Thailand for next year in addition to 10 projects for which it already signed contractual purchasing agreements.

EDF's portfolio in Thailand includes Clean Development Mechanism (CDM) projects in biomass, biogas from waste, landfill gas capturing, and wind farms.

"We expect to have five to six more projects in Thailand next year with projects under discussion including a waste heat generator (WHG), biomass and energy efficiency projects," said Suchai Lertpichet, a representative of EDF in Thailand.

The CDM allows industrialised nations to buy carbon credits from projects in developing countries to meet their emission reduction commitments under the Kyoto Protocol by 2012. Carbon credits are used in emission trading schemes globally in the form of certified emission reduction (CER) certificates.

"The sector is going to get a boost from a coming tax incentive for carbon credit revenue granted by the Finance Ministry," said Mr Suchai.

The 7.7 MW Decha Bio Greens biomass project in Suphan Buri, one of the projects signed with EDF, is in the verification process and expects to get CER issuance at the beginning of next year.

EDF executives attended a renewable energy forum last month called France Green Tech, where a number of companies expressed keen interest in investing in Thailand.

MPO, the European leader in optical disks, cited Thailand as a promising investment location for its new photovoltaic (PV) cell business outside France. MPO chairman Loic de Poix said: "Thailand is very attractive for our investment given the country's high consumption of electricity with no (definite) nuclear programme in place."

At the end of September state-owned utility the Electricity Generating Authority of Thailand said the proposed nuclear power plant is likely to be delayed by at least one to three years from the schedule of 2020.

Thailand's attractiveness as a location for solar power was underlined by the recent signing of a loan agreement by the Asian Development Bank to provide $140 million to the Bangchak Petroleum Company to build two solar power plants.

Bangchak, a partly state-owned oil refinery and petrol retailer, has already started construction on the 8 MW and 30 MW solar plants in Ayuthaya province, which will be completed next year.

"This marks one of Thailand's biggest solar power plant projects and clearly shows the viability of large-scale solar power generation in the country," commented Joe Yamagata, Deputy Director General in ADB's Private Sector Operations Department.

The investment in solar plants is in line with the government's target to obtain 20.4 per cent of its energy from renewable sources by the year 2022.

Pakistan reforms to attract investment for new capacity

Pakistan has dissolved the state-owned Pakistan Electric Power Co. to meet conditions for a badly needed loan from the International Monetary Fund, and replaced it with five autonomous, area-specific companies.

According to IGI Securities, a private consultant hired jointly by the Ministry of Water and Power and the World Bank, Pakistan needs to add about 20 000 MW of generating capacity in 10 years at a cost of $32 billion.

Of the total $32 billion, about $17 billion would be provided by the government and the remaining $15 billion through private investment.

However, IGI said that foreign investments in the power sector had been almost non-existent over the last eight years and only four per cent of the total investment went into the power sector.

Minister for Water and Power Raja Pervez Ashraf said the dissolution of PEPCO is a first step toward power sector reforms prescribed by the IMF and other international financial institutions.

The dissolution was prescribed by the IMF as part of a plan to eliminate subsidies for the power sector.

PEPCO had been purchasing electricity from the private sector at a rate much higher than that it was charging consumers, creating an unsustainable circular debt and badly hurting the health of private and public sector oil and gas marketing companies, refineries and private power producers.

In 2008, Pakistan and the IMF negotiated two facilities worth nearly $12 billion, but the IMF withheld disbursement of its last tranche for want of several power sector and taxation reforms.

Pakistan has announced it wants to negotiate another IMF loan once the current programme expires this year.

Korea prepares for global nuclear role

South Korea will train 24 000 new nuclear energy personnel by 2020 to meet the country's goal of becoming one of the leading commercial atomic reactor exporters in the world, the government said.

The plan, outlined by the Ministry of Knowledge Economy at the national economic policy meeting chaired by President Lee Myung-bak [Yi Myo'ng-pak], reflects Seoul's ambitious plan to secure an average of two overseas nuclear reactor orders per year in the next 10 years.

To meet the goal, Seoul will designate two specialised universities to train qualified personnel in the near term, while the number of such schools will be increased to 10 in the coming year. In addition, some high schools near existing nuclear power plants will receive support so they can help train aspiring atomic energy engineers, the ministry said.

At present, South Korea has 21 000 nuclear-related engineers that are sufficient to deal with the workload of building the four reactors for the United Arab Emirates (UAE) – the first overseas order for Korean nuclear reactors since it began commercial atomic power generation in the late 1970s. However, the number of engineers will need to increase to cope with the country's masterplan to win overseas orders for 80 reactors by 2030.

Last month, South Korea signed a cooperation accord with South Africa that may see it play a role in the African nation's planned construction of nuclear power plants and other energy projects.

South African Deputy President Kgalema Motlanthe said his government will soon draw up a long-term energy development plan including the construction of nuclear power plants, and expressed hope that South Korea would be able to participate in the plan by using its expertise on construction and operation of nuclear and thermal power plants.

Korea aims to be in clean energy top five

Korea is aiming to be one of the world's top five clean energy countries by 2015 following the unveiling of its Five Year Plan.

South Korea will invest 40 trillion won ($35.4 billion) over five years to support renewable energy development, with funding from the public and private sectors.

Under the five-year plan, unveiled by the Ministry of Knowledge Economy – the government will commit 7 trillion won ($ 6.2 billion) and the private sector will inject 33 trillion ($2.9 billion), *The Korea Times* reported.

The investment aims to accelerate Korea's path to a low-carbon economy, with support for solar and wind energy technologies, including the construction of 2.5 GW of offshore wind capacity. The initiative is forecast to create 110 000 jobs, the government said.

The Five Year Plan follows just weeks after government officials said they would soon launch a 9 trillion won ($7.8 billion) project to build the country's largest offshore wind farm in the Yellow Sea.

The government said it would build a "proving area" in the Yellow Sea by 2012 to test some 20 turbines from various manufacturers.

Following the completion of the first-stage construction of 20 test turbines in 2013, instead of 2012, the government will build an "experimental complex" with two hundred 5 MW turbines, according to officials from the Ministry of Knowledge Economy.

By 2019, the country will have 1000 offshore wind turbines capable of delivering up to 5 GW, some 30 km off the coast of southwestern South and North Jeolla provinces.

The Ministry of Knowledge Economy also said the government has completed revising all its regulations and decrees related to the development, use and distribution of renewable energy to introduce a new Renewable Portfolio Standard (RPS).

According to the ministry, the RPS requires all electric power companies generating and selling more than 500 MW of electricity per hour to gradually increase the proportion of their power supplies generated from renewable energy sources. The RPS, which will become effective in 2012, will mandate 350 MW of additional renewable energy per year through 2016, and 700 MW per year through 2022. This will increase the proportion of electricity generated from renewable energy sources from 2 per cent in 2012 to 10 per cent in 2022.

Starting next year, all government and state-run enterprise buildings with an office space of 1000 m^2 or larger must use renewable energy sources for at least 10 per cent of all of their energy needs. The rate increases to 20 per cent in 2020, according to the ministry.

Malaysia moves to boost renewables

Renewables to reach 2 GW by 2020
Feed-in-tariffs proposed

Malaysia has set a target of increasing its renewable generating capacity to 2080 MW or 11 per cent of its generating mix by 2020 said Minister for Energy, Green Technology and Water, Datuk Seri Peter Chin Fah Kui in October.

In order to reach the target, the country is looking to implement a feed-in-tariff (FIT) to allow electricity generated from renewable sources by individuals and independent providers to be sold to the nation's utilities. The plan, which is being rolled into Malaysia's proposed Renewable Energy Act, is expected to go before parliament this month (November).

"Once the act is passed, we will be setting up a new agency, Sustainable Energy Development Authority (SEDA), to oversee the implementation of renewable energy and then only can we make a decision on the feed-in-tariff mechanism," said Kui.

While many of the details of the renewable energy plan have yet to be worked out, Chris Eng, an industry analyst with OSK Research, believes that the feed-in tariff could result in higher energy prices for consumers.

In an interview with the *Malaysian Star* newspaper, Eng said under the plan "the national utility would be obliged to buy renewable electricity at above-market rates set by the government over a specific period of time from the day the system is connected to the grid".

The 2 GW renewables target is in line with the framework of the 10th Malaysia Plan (2011-2015), which gave emphasis to the use of such energy, said Datuk Kui.

"Although the application of green technology is still new in our country, we should not lag in taking advantage of opportunities to introduce green technology products," he added.

Malaysia is determined to be a regional hub for solar energy. So far it has attracted more than $4 billion in foreign direct investment to the solar photovoltaic (PV) industry.

Speaking at the International Greentech and Eco Products Exhibition and Conference Malaysia, Prime Minister Najib Razak said: "Over the next decade, we intend to focus on increasing the flow of foreign and domestic direct investments in green technology… I am happy to note that many countries chiefly, Germany, France, the UK, Italy, South Korea, Japan and China have committed to helping Malaysia develop and apply green technology."

Najib said Malaysia's Renewable Energy Policy and Action Plan had targeted about 6 per cent or 985 MW of electricity generation in the country to come from renewable sources by 2015, increasing by a further 5 per cent by 2020.

UK preserves capital spending on energy

The UK's energy industry has largely survived a round of severe government spending cuts as the country gears up for a decade of major capital investments.

Siân Crampsie

The UK's energy industry and environmental groups alike have expressed disappointment over the £1 billion pledged by the government to establish the proposed Green Investment Bank (GIB).

The £1 billion pledge – announced in October in the UK's wide-ranging fiscal spending review – falls short of the £4-6 billion figure that advocates say is needed but will be supplemented through the sale of government assets.

The GIB is seen as being essential to the UK's plans to decarbonise the energy sector. It will fund green infrastructure development and help to fill the funding gap created by risk that commercial lenders cannot finance.

The spending review has slashed the budgets of most government departments in an effort to cut the UK's budget deficit. However, many clean energy capital spending projects were left untouched.

It came as the country's Department of Energy and Climate Change (DECC) highlighted the need for a surge in investment in new energy sources in order to secure the country's energy supplies.

The need for investment in the UK's electricity sector has also been raised by regulator Ofgem, which says that more than £200 billion needs to be spent in the next ten years – most of it on power plants, and £32 billion on the transmission network.

The DECC's resource spending is to fall by 18 per cent in real terms over the next four years, but its allowance for capital spending is to rise by 41 per cent over that period.

DECC says that at least one-quarter of the UK's electricity generating capacity needs to be replaced by 2020. It is also expecting over half the new energy generating capacity built in the UK by 2025 to come from renewable sources, with a "significant proportion" of the remainder coming from low carbon sources such as nuclear and fossil fuels with carbon capture and storage.

Connecting the new plants to the grid – especially the renewable energy plants – and the need for 'smart grid' technologies will drive some of the spending, according to Ofgem. Transmission and distribution firms will need to double the rate of investment in the grid of the last 20 years.

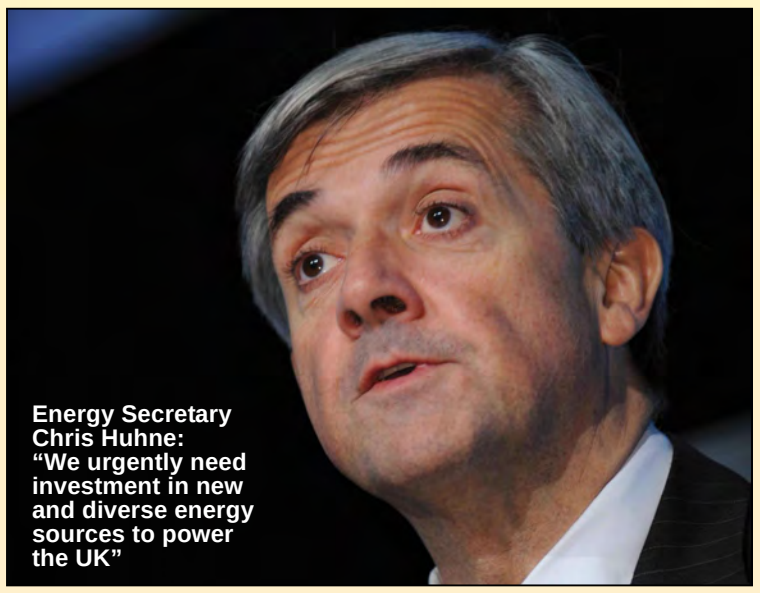
"We urgently need investment in new and diverse energy sources to power the UK," said Energy Secretary Chris Huhne. "We'll need renewables, new nuclear, fossil fuels with CCS, and the cables to hook them all up to the grid as a large slice of our current generating capacity shuts down.

"The market needs certainty to make this investment happen, and we are determined to clear every obstacle in the way of this programme."

In an attempt to get the wheels of investment moving, DECC published a revised set of national policy statements on energy, which included the confirmation of eight sites deemed suitable for the construction of new nuclear power plants, clarification of the government's position on its "no subsidy" policy for new nuclear capacity, and the regulatory justification of two new nuclear reactor designs – Westinghouse Electric Co.'s AP1000 and Areva's EPR.

But while the spending review saved schemes such as the renewable heat programme and feed-in-tariffs, the government decided that it could not commit to funding the £30 billion Severn Barrage tidal power scheme.

A feasibility study into the Severn scheme – for which a number of possible tidal barrage projects were considered – found that there is "no strategic case for major public sector investment in a large-scale energy project in the Severn estuary" and that the proposed projects were high in cost compared to other ways of generating electricity.

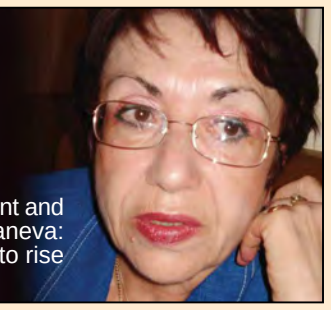


Energy Secretary Chris Huhne: "We urgently need investment in new and diverse energy sources to power the UK"

The government also committed £200 million to funding low-carbon technologies such as offshore wind in the spending review, and reaffirmed its commitment to carbon capture and storage (CCS) technology with a £1 billion "prize" to the winner of its CCS demonstration competition.

Consumers question cost of renewables

- Czechs plan solar tax
- Bulgaria examines cost of carbon



Bulgaria Deputy Environment and Water Minister Evdokia Maneva: Electricity prices set to rise

German businesses are calling on the country's government to abolish a surcharge that is levied on electricity consumers to help support the development of renewable energy.

The levy is set to rise by around 70 per cent next year and Germany's Federal Association of Energy Users (VEA) says that the government should either scrap the surcharge, or control the development of renewable energy.

The projected sharp rise in the levy – from just over 2 eurocents/kWh to over 3.5 eurocents – is mainly due to the rapid rise in renewable energy generating capacity, and photovoltaic (PV) solar capacity in particular.

Germany is not the only country that is debating sharp rises in the cost of electricity due to the rapid uptake of solar PV and other renewable technologies. The Czech Republic last month approved a fresh set of measures aimed at curtailing an expected hike in electricity prices caused by the country's solar power boom.

The Czech government is planning to tax solar power producers that installed their plants in 2009 and 2010. The revenues will be used to subsidise power prices for end users.

Earlier this year the Czech government announced plans to scrap a subsidy scheme for solar power plants. The move followed that of Spain, which has also reduced generous feed-in tariffs for solar and wind energy plants.

As in the Czech Republic, Germany's generous subsidy system for renewable energy has resulted in a boom in installations based on solar power and wind energy technologies. Germany is aiming to generate 50 per cent of its electricity from renewable sources by 2030 – a target that it appears on track to meet.

Electricity prices in Bulgaria are also set to rise because of the need for electricity producers in the country to purchase carbon dioxide allowances, according to the country's Deputy Environment and Water Minister Evdokia Maneva.

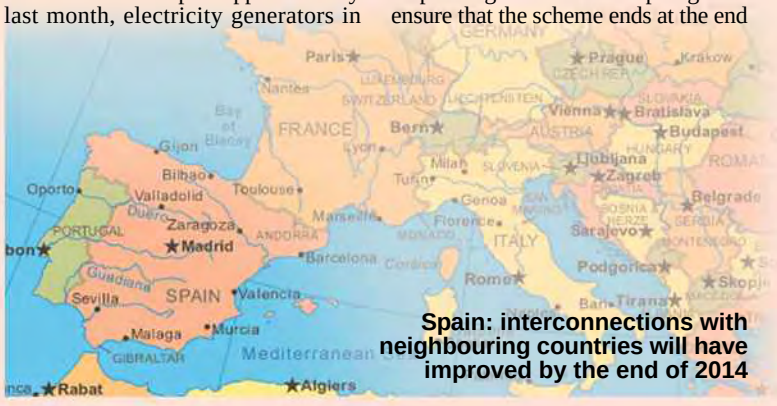
Bulgaria's industrial sector currently emits more carbon dioxide than allowed under its EU Accession treaty and the need to purchase allowances could force electricity prices to rise by as much as 20 per cent.

Spanish aid for coal approved

A controversial plan designed to support Spain's domestic coal sector has been approved by the European Commission.

Under a state aid plan approved early last month, electricity generators in Spain that use domestic coal in their power stations will be given priority in the country's wholesale electricity market.

Spain's government has pledged to ensure that the scheme ends at the end of 2014, and says that it is required in order to improve energy security in the country.



Spain: interconnections with neighbouring countries will have improved by the end of 2014

Environmental groups have strongly criticised the plan.

The scheme is in line with EU rules because it will compensate electricity generators who have had public service obligations imposed on them by the government. It has also been approved on the grounds of energy security, says the European Commission.

Environmental groups such as WWF say that security of supply is not an issue in Spain, which has been a net exporter of electricity for the last six years. According to environmental law organisation ClientEarth, the scheme will distort competition.

The Spanish government argues, however, that its limited electricity interconnections with other countries and the high proportion of renewable energy in its system leave it vulnerable. It says that interconnections with neighbouring countries will have improved by the end of 2014.

Marta Ballesteros, senior lawyer at ClientEarth, said: "The Commission's plan to approve Spain's support for its coal industry sends confusing signals about the sort of investments likely to reap dividends in Europe's power sector in future.

"It will also artificially skew the market against plants producing energy by cleaner means. The Spanish government should not be allowed to undermine the progressive environmental objectives set by the EU and the Commission should not set this troubling precedent."

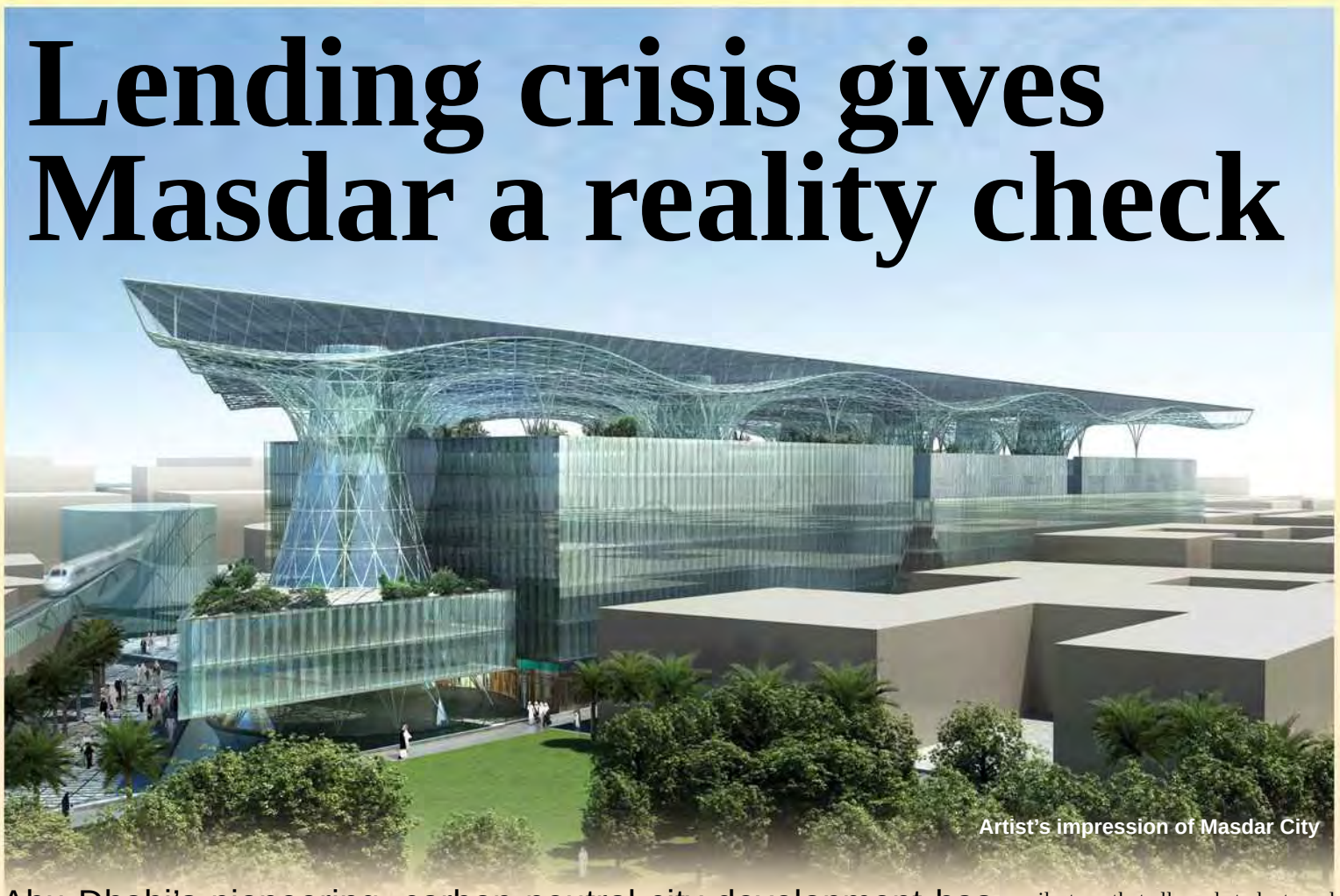
Greece plans green economy

Greece is hoping that a plan to attract billions of euros of investment in renewable energy will help it to turn around its ailing economy.

Prime Minister George Papandreou has announced that the country is aiming to secure investments totaling €44 billion by 2015 in renewable energy projects as well as schemes to enhance environmental governance and the sustainable management of natural resources.

Green investment in Greece stood at €400 million in 2009 and is expected to reach €1.2 billion in 2011.

Lending crisis gives Masdar a reality check



Artist's impression of Masdar City

Abu Dhabi's pioneering, carbon neutral city development has reported steady progress but has fallen foul of the financial crisis.

Siân Crampsie

The international financial climate has forced the company behind the $22 billion Masdar City project to re-think its plans for the ambitious 'ecopolis'.

A ten-month strategy review of the project in Abu Dhabi has revealed key changes to the original plans for the sustainable city, including a $3.3 billion budget cut, a revised project schedule and ditching a pledge to generate all of the city's energy needs on-site.

Plans for a city-wide mass rapid transport system have also been radically scaled back.

According to Masdar, the Abu Dhabi government-backed firm executing Masdar City, the review has taken into account "market and technology developments" that have emerged since the plans for Masdar City were developed in 2006.

The reality for the firm is that real estate lending has dried up since the Dubai financial crisis, and financing for renewable energy projects is harder to come by. Companies have also been reluctant to commit to renting commercial space in Masdar City.

The project is the cornerstone of Abu Dhabi's plans to position itself as a major player in the global market for renewable energy technology and expertise. It was also promoted as the world's first carbon-neutral city.

The announcement of the revisions to Masdar's plans in mid-October were followed by news that Helene Pelosse, Director General of the International Renewable Energy Agency (IRENA), was stepping down from her post.

Abu Dhabi won a bid in June 2009 to host the organisation's headquarters and IRENA, which was established in early 2009 – is due to move into Masdar City in 2015.

Pelosse was outwardly opposed to the UAE's strategy to develop nuclear power and carbon capture and storage technology, and her unexpected resignation was followed by rumours that she was forced from her post.

Pelosse told the *AFP* news agency that she had faced intimidation by intrusions into her home and had her phones and offices bugged.

Announcing the developments to its flagship project, Masdar was keen to point to the project's achievements so far: the completion of the first six buildings of the Masdar Institute, a milestone that allowed students and faculty to move in to the new facility; residential units that use over 50 per cent less water and energy than typical UAE buildings; and 30 per cent of electricity demand provided by rooftop solar photovoltaic panels.

"From the beginning, Masdar has been engaged in a journey of discovery to create a blueprint for the future of sustainable cities. Our steady progress is being built on our ability to discover the best technologies and approaches to sustainable urban living and bring them most effectively to Masdar City," said Dr. Sultan Al Jaber, CEO of Masdar.

The revised plans mean that Masdar City's one million square meter Phase 1 development will be completed in 2015 and the final build-out by 2020-2025. Masdar also says that it has realised that it will no longer be able to rely solely on on-site clean energy sources.

It is planning to purchase renewable energy from off-site locations in order to fulfil its pledge to be 100 per cent renewable energy-powered. It is also going to explore the potential for other technologies such as geothermal energy and solar thermal cooling.

"As the construction phase progresses, we will be continually learning, adjusting and moving forward towards our vision for Masdar City," said Dr. Al Jaber. "As technology and the market evolves, so will our plan. The key is to be flexible and adaptable rather than rigid and dogmatic. By doing so, we can constantly apply the knowledge captured during our development to the delivery of our Master Plan.

"We will continually review and update our thinking so Masdar is always at the cutting-edge of global clean technology."

Around 13 companies have now committed to becoming tenants at Masdar City, the latest being Siemens, which last month signed a long-term strategic agreement with Masdar. Masdar says that it wants to have 400 firms as tenants by 2020.

Siemens' recent deal with Masdar indicates that backing for the project from the energy sector remains strong, with companies keen to build long-term relationships with the renewable energy pioneers of the Middle East.

In addition to housing its Middle East headquarters in Masdar City, the German firm has pledged to establish a Centre of Excellence in Building Technologies there, implement a smart grid in Phase 1 of the Masdar City development and collaborate with Masdar in the field of Carbon Capture and Storage (CCS).

The research and development aspect of the partnership with the Masdar Institute is Siemens' largest global investment of its kind with a science and technology organisation. It comprises a long term R&D programme for smart grids, smart buildings, and CCS and will manifest itself in grants, scholarships and educational programmes for the advancement of the knowledge economy in the UAE.

The Siemens Middle East headquarters facilities in Masdar City will showcase the latest energy efficient technologies developed by the company and when complete, will accommodate a staff of almost 2000 specialists.

The company plans to occupy 18 000 m^2 that could be extended to 25 000 m^2 in the longer term.

Kazakhstan lures investment

The Central Asian nation of Kazakhstan is joining forces with overseas companies to help it to develop its power sector.

Russia's largest hydropower company, RusHydro, has signed a deal to build jointly a number of hydropower and wind power plants in southern Kazakhstan.

Kazakhstan has also signed a deal with South Korea to build a $3.8 billion coal-fired power plant near the city of Balkhash.

Construction of the 660 MW power plant, one of the biggest joint economic projects ever between the two countries, will start in the first half of next year with an aim to finish in 2016.

RusHydro is to share its technologies in designing, building, launching and managing hydro and wind power plants, and could also build small-scale hydropower plants in the Almaty region.

South Africa signals shift away from coal

South Africa is set to announce plans for a massive solar energy park that will form the cornerstone of its strategy to reduce dependence on coal-fired electricity generation.

The country's government recently released its draft Integrated Resource Plan (IRP) in which it proposes a drastic change in the electricity generation mix to replace coal-fired plants with nuclear and renewable energy.

The change is necessary to achieve a balance between the cost of generation and the need to reduce carbon emissions while meeting the growing demand for electricity, argues the government.

The proposed 5 GW solar park would be established in Northern Cape province and could provide up to ten per cent of South Africa's electricity needs. US engineering firm Fluor has been tasked with developing a detailed conceptual master plan for the 200 billion rand ($28.3 billion) project.

South Africa's switch to clean energy sources could signal further financial support from the World Bank, which earlier this year agreed a controversial $3.75 billion loan to help support development of the Medupi coal-fired power plant.

Coal currently accounts for 90 per cent of electricity generation in South Africa and nuclear six per cent. The draft integrated resource plan proposes that coal contributes 48 per cent to the energy mix by 2030, followed by renewable energy (16 per cent), nuclear (14 per cent), peaking open cycle gas turbine (9 per cent), peaking pump storage (6 per cent), mid-merit gas (5 per cent) and baseload import hydro (2 per cent).

UN backs Russian JI project

A new combined cycle gas turbine plant in Russia has become the first in Russia to become a joint implementation project under the UN's Kyoto Protocol.

The 400 MW CCGT plant at Shaturskaya, near Moscow, is being completed by E.On and its Russian company OGK-4. They say that the plant will save over one million tonnes of carbon by 2012.

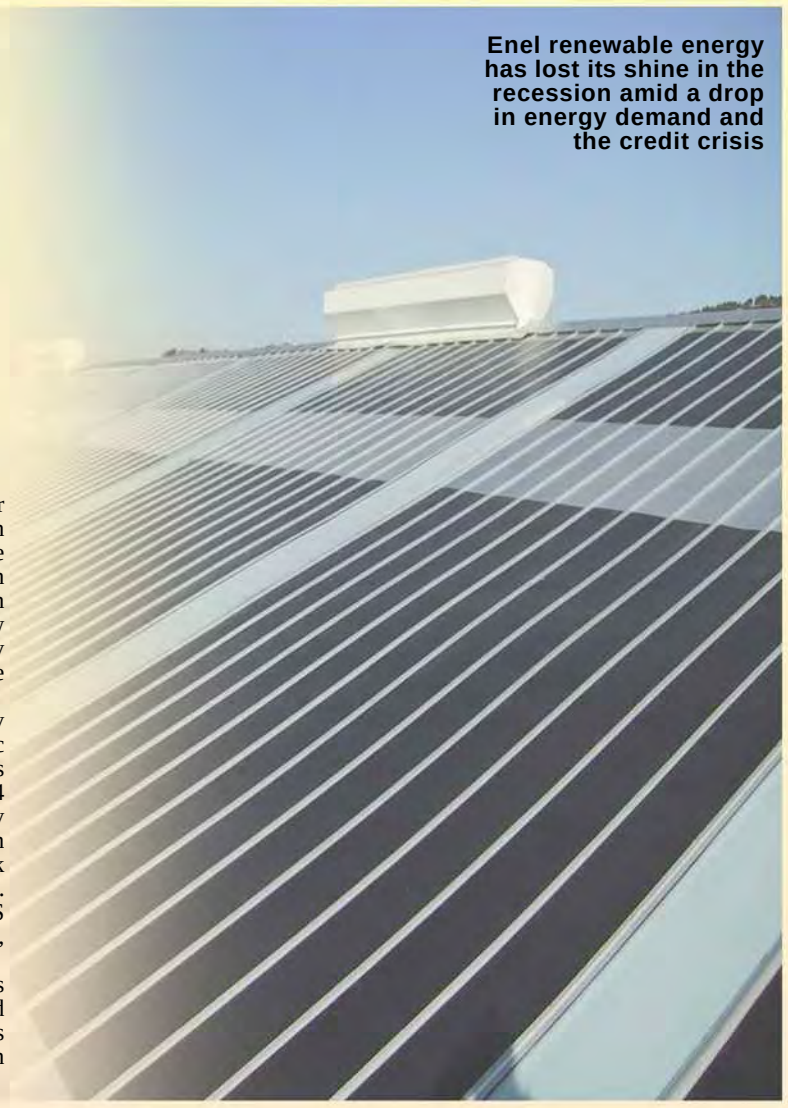
The project was approved by the JI supervisory committee of the UN Framework Convention on Climate Change (UNFCCC). The approval means that the plant will generate carbon credits – known as Emission Reduction Units (ERUs) – that can be traded or used to meet emission targets.

Hervé Touati, Managing Director of E.On's Carbon Sourcing business said: "This is a major step forward for carbon markets. The approval of Russian JI projects will add liquidity to the market and gives companies like E.On the confidence to invest further in carbon reduction projects in the region."

The carbon credits generated by the power plant can be used for compliance by governments under the Kyoto Protocol, or by industrial companies within the EU Emission Trading Scheme (ETS).

Enel reduces Green Power price

- IPO will test market confidence
- First Wind cancels IPO



Enel renewable energy has lost its shine in the recession amid a drop in energy demand and the credit crisis

Enel could miss its €3 billion target for revenue from the sale of its renewable energy unit after it was forced to cut the share price in order to attract institutional investors.

The Italian utility is selling around a third of Enel Green Power (EGP) in order to cut debt and reduce the risk of a credit downgrade.

It said in mid-October that it would offer shares for €1.80-2.10 each, but revised that range to €1.60-2.10 in order to "achieve a better balance between retail shareholders and institutional investors", according to a statement from the firm.

The IPO – scheduled for early November – will be a test of investor confidence in the renewable energy sector, which has lost its shine in the recession amid a drop in energy demand and the credit crisis.

The share offer has been oversubscribed, according to news reports, but mainly driven by demand from retail investors. The reduced price should help to attract more offers from institutional investors.

Enel is Europe's most heavily indebted utility, with €54 billion of borrowings. The EGP IPO, together with an asset disposal programme, should cut this to €45 billion.

Shares in Spain's Iberdrola Renovables, the world's largest wind farm operator, have halved in price since it floated in late 2007. Portugal's EDP Renováveis has seen its shares fall a similar amount since it was listed in 2008.

EGP says it is aiming to reverse that trend by offering a more diversified renewables portfolio with less reliance on wind power subsidies compared with its competitors.

The company operates wind, solar, geothermal, hydroelectric water flow and biomass energy plants in Europe, South America and the USA, where investor confidence in renewable energy has also fallen amid reduced energy demand, low natural gas prices, and uncertainty over legislation covering renewable energy.

In October, US wind energy company First Wind Holdings Inc cancelled its IPO after cutting its expected share price range by 24 per cent. The company had initially hoped to raise $300 million from the IPO, but later scaled back expectations to $228 million.

It would have been the first US wind company to attempt a listing, according to *Reuters*.

The IPO – which will see EGP's shares listed on the Milan and Madrid stock exchanges – is expected to be the largest European IPO in three years.

UTC launches Clipper rescue

Clipper Windpower has been thrown a lifeline through an offer from UTC to buy all of the remaining shares in the wind power company.

UTC already owns just under 50 per cent in Clipper, and says that its offer will enable Clipper to overcome the challenging market conditions in the wind energy sector.

The $112 million deal would give UTC full control of Clipper and also enable the technology firm to grow its portfolio of advanced, clean technologies.

Connecticut-based UTC owns a diversified range of energy efficient products including gas turbines and fuel cells. It says that its buy-out of Clipper will provide the wind turbine firm with the "long-term financial stability necessary for… continued growth".

"In the context of the challenging environment that Clipper has faced in recent years, we believe that the transaction represents good value for our shareholders and provides substantial benefits for our customers and employees," said Mauricio Quintana, President and Chief Executive Officer of Clipper.

UTC reported in October a one per cent increase in revenues for the third quarter compared with the same quarter last year. Earnings per share were up 14 per cent.

"UTC's results this quarter reflect solid operating leverage with strong conversion on organic revenue growth," said Louis Chênevert, UTC Chairman and Chief Executive Officer. "Sustained and structural cost reduction actions drove record segment operating margin, while we increased our investment in new game changing technologies."

GE expands technology portfolio

John Krenicki: vice chairman of GE and president and CEO of GE Energy

GE is continuing to expand its technology portfolio in spite of difficult market conditions.

The US industrial giant reported a five per cent fall in revenues for the third quarter compared to the same quarter last year, but said that it could see signs of a slow recovery in a few areas of its business.

The company has also signed deals to acquire Dresser, a global energy infrastructure technology and service provider, and has also acquired Calnetix Power Solutions, a US company that develops innovative technology for small-scale waste heat-to-energy projects.

GE is spending $3 billion to acquire Dresser, and says that the acquisition will expand its core energy offerings and extends its reach into adjacent offerings for its energy and industrial customers around the world.

"Dresser is a great fit for the GE business model," said John Krenicki, vice chairman of GE and president and CEO of GE Energy. "Eighty-five per cent of Dresser's revenue is from energy customers, and it has developed a large installed base of equipment, which is a big reason why 40 per cent of its total revenue is derived from aftermarket service offerings, and there is a lot of room for future expansion."

Krenicki added: "Dresser has a global franchise and brand with 60 per cent of revenues outside of North America, which will be accelerated by GE's global footprint. Through the acquisition, we will bring to bear our focus on research and development to Dresser's highly engineered custom solutions and create an opportunity for Dresser's 6300 talented employees to dramatically expand their businesses."

Dresser's portfolio includes technologies for gas engines, control and relief valves, measurement, regulation and control solutions for gas and fuel distribution.

In a parallel move, GE has bought Florida-based Calnetix whose technology allows industrial sites to capture waste process heat and use it to generate electricity. The acquired business will be integrated into GE's Jenbacher gas engine business, based in Jenbach, Austria.

"Alternative energy sources such as waste heat are growing in importance given the urgent global need for more efficient use of our limited resources. Acquiring CPS's technology gives us a tremendous opportunity to enter this very promising, small-scale waste heat to power segment with a competitive, fully commercialised offering. Because of its energy efficiency and zero emissions, we see this industry sector as a $1 billion global space with high growth opportunities," said Steve Bolze, president and CEO of GE Power & Water.

In addition to the CPS assets, GE also acquired certain underlying intellectual property from Calnetix, Inc., CPS's parent company. All of the acquired assets, along with GE's Jenbacher technical and distribution capabilities, will enable GE to provide advanced and comprehensive offerings for customers in the waste heat recovery power generation space.

"This suite of technology is a natural fit for our business," said Prady Iyyanki, CEO of gas engines for GE Power & Water. "By adding CPS's capabilities to our existing portfolio of turbines and engines using waste gases or other alternative energy sources, we are now well positioned to become the industry's waste heat to power expert."

Alstom cuts back amid recession

The global economic crisis is forcing Alstom to cut its power sector workforce by 4000, the France-based technology firm said last month.

The job cuts will occur before March 2012 and will affect positions in the central functions of its power sector division as well as those dedicated to new equipment for coal and gas fired power plants.

They will be implemented in Europe and North America where "the new equipment markets for coal and gas power plants are most affected by the economic crisis", said a statement from Alstom.

The company's orders for power systems and services dropped 35 per cent in the April to June period to €1.95 billion, while sales fell six per cent to €3.17 billion.

One-quarter of the positions affected will come from the non-renewal of temporary contracts and the non-replacement of people leaving the company. Its services and renewable energy sectors will not be affected.

Americas

SMUD orders Vestas wind turbines

California-based utility Sacramento Municipal Utility District (SMUD) has placed an order with Vestas for the supply of wind turbines for the Solano 3 wind farm.

Under the contract Vestas will supply 24 of its V90-3.0 MW wind turbine and 31 of its V90-1.8 MW turbine for the project, located near Rio Vista, California.

The contract also includes commissioning of the units along with a service and maintenance agreement of up to 15 years.

Commissioning of the wind farm will take place in early 2012.

TVA selects B&W for Bellefonte

The Tennessee Valley Authority (TVA) has awarded Babcock & Wilcox (B&W) Canada Ltd a contract to design and manufacture two steam generators for the Bellefonte Unit 1 nuclear power plant in Alabama as part of plans to complete construction of the Bellefonte plant.

The once-through steam generators will be designed and manufactured by B&W Canada and are scheduled to be delivered to the Bellefonte site in 2015, pending a decision by the TVA Board to complete construction of Unit 1.

In October TVA also awarded a contract to France-based Areva for work on the Bellefonte 1 project, including engineering work, installation of new digital instrumentation, a control system and an advanced control room.

In August 2010, TVA board members approved spending of $248 million on Bellefonte Unit 1, which includes initial engineering design and project staffing, preservation and maintenance, long-term procurement and developing a regulatory framework for completion of the partly-built plant.

Siemens steam turbines selected for Ivanpah CSP

US-based BrightSource Energy Inc. has signed contracts with Siemens for the supply of two steam turbine generators for its Ivanpah solar thermal power plant in California.

The contracts follow BrightSource Energy's purchase of a Siemens steam turbine generator in December 2008 to be used at Ivanpah's Unit I. The latest contract is for the supply of two 133 MW steam turbines to be used at Ivanpah's Units II and III.

When complete, the 392 MW Ivanpah will nearly double the amount of solar thermal electricity produced today in the USA. "The purchase of all three steam turbine generators for the Ivanpah project marks another key milestone in building the world's most efficient solar power plant," said Israel Kroizer, Chief Operating Officer, BrightSource Energy.

Emerson wins PV contract

Emerson has been awarded a contract to supply power inverters and plant-wide controls for what will be California's largest photovoltaic (PV) power generation facility and one of the largest in the world.

Quanta Services awarded the contract to Emerson for the solar project in Kings County, California, which will generate 45 MW of energy when complete in mid-2011.

Emerson's inverters and software will convert DC power from the plant's photovoltaic arrays into AC power that is fed to the electric grid. The inverters will be controlled through Emerson's state-of-the-art Inverter Management System, with overall plant control and interconnection with the electric grid provided by Emerson Process Management's Ovation distributed control system.

Asia Pacific

Alstom to build 800 MW CCGT in Singapore

Keppel Merlimau Cogen (KMC) Pte Ltd has selected Alstom to build up to 800 MW of gas-fired combined cycle generating capacity in Singapore.

KMC and Alstom have signed the agreement for the first phase of the project, involving the construction of a 400 MW CCGT plant. The second 400 MW phase should be booked in 2011, says Alstom.

Together the two plants will boost Singapore's generating capacity by ten per cent, and will increase Keppel's portfolio to 1300 MW, making it one of the country's largest energy providers.

Under the contract, Alstom will provide the entire power plant and all associated equipment, including one GT26 gas turbine, one steam turbine and one heat recovery steam generator for each unit.

BHEL to build solar plants

India's Bharat Heavy Electricals (BHEL) has won contracts worth $7.9 million to build solar plants on India's Lakshadweep islands.

Awarded by the Lakshadweep Administration, the order includes the turnkey construction of grid-connected solar power plants on eight islands, including the capital Kavaratto. It also calls for the renovation of a further 800 kW of solar capacity.

The new plants will be finished by May 2011 while the renovation portion of the project will be completed in early 2012.

China solicits solar thermal tenders

China has started the development of its first commercial solar thermal power plant, soliciting tenders for a 50 MW facility to be built in Hangjinqi in Inner Mongolia Autonomous Region.

The $240 million project is thought to be an important part of China's efforts to diversify its energy resources as it will provide a platform for the growth of solar thermal technology in the country.

China's National Development and Reform Commission approved the project in 2007. The National Energy Administration has tasked the China Machinery and Equipment International Tendering Company with overseeing the bids for the project.

Suzlon bags India orders

Wind turbine company Suzlon has won new orders totalling 168.5 MW from several India-based companies.

The contracts include a number of repeat orders, including a 12.6 MW project in Rajasthan for The Friends Group, a 10.5 MW of capacity in Maharashtra and Rajasthan for Goa-based M/s G N Agrawal, and a 7.5 MW project in Gujurat for Ambuja Cement.

Other orders received by Suzlon in India include a 33 MW wind farm for Gujurat State Fertilizer & Chemicals, and an 18.9 MW project in Tamil Nadu for Sai Regency Power.

Toshiba to build 3 MW solar plant

Toshiba Corp has said that it is to build a 3 MW solar power plant in Japan's Hiroshima Prefecture for Chugoku Electric Power Co.

Under the $8.5 million contract, Toshiba will design, engineer and build the plant, using solar cells produced by Choshu Industry Co. The plant will be Chugoku Electric's first solar power plant for use in its utility business.

The plant is scheduled to start operating in 2011.

Europe

Siemens wins offshore grid maintenance contract

TenneT has awarded maintenance service contracts for two offshore grid connections in the German North Sea to Siemens.

The service contracts are for five years and cover the HelWin1 and BorWin 2 connections that link several offshore wind farms to the German mainland grid. The two contracts are Siemens' first within Germany.

Siemens earlier this year won the contracts to build the two grid connections, and says that it is now planning to "aggressively develop" its maintenance business in the field.

The services covered by the contract include preparing the maintenance schedules, coordinating and executing inspections, preventive maintenance and repairs, and providing the related logistics and spare parts management services. The German firm is planning to set up a service base in Lower Saxony to help support the maintenance operation.

ABB to build PPC substation

Greece's Public Power Corporation (PPC) has placed a $20 million order with ABB to build a 150/20 kV substation in Athens.

The Ampelokipi indoor gas insulated switchgear (GIS) substation will be located in the city's metropolitan area. It will increase the capacity of the urban power distribution network and facilitate reliable power supply to household consumers as well as hospitals, government and commercial buildings.

Under the contract, ABB will be responsible for the design, engineering, supply and installation of the new substation and will supply key equipment including eight 150 kV GIS bays, three 150/20 kV 100 MVA power transformers and 150 arc-proof type switchgear panels.

Fluor wins CSP contract

Fluor says that it has expanded its position in the market for concentrated solar power (CSP) plants by winning an engineering services contract for two new plants in Spain.

The US firm is to provide basic and detailed engineering and other associated services for two 50 MW CSP plants being developed by Elecnor. It says that its involvement in the Astexol 2 CSP project in Badajoz, Spain, positioned it well for winning this latest contract.

The project is under way with engineering expected to be complete by the third quarter of 2011. Fluor's Asturias and Madrid, Spain, operations will lead the engineering effort with support from its southern California operations centre.

Siemens wins DanTysk order

Vattenfall Europe and Stadtwerke München have awarded the contract for the supply and installation of wind turbines for the DanTysk offshore wind power plant in the North Sea to Siemens.

The German engineering firm will supply 80 of its SWT-3.6-120 turbines to the project, which will be located 70 km west of the island of Sylt in water depths of up to 30 m. The order is Siemens' fourth for a commercial offshore wind power plant in German waters.

Installation of the wind turbines is due to begin in 2012.

UK orders network management system

The UK's National Grid has placed an order with ABB for the provision of a market management system to help balance supply and demand for electricity in the country.

ABB's Network Manager Market Management System (MMS) will replace National Grid's current system for managing the UK's total electricity demand of more than 55 000 MW. The system will improve the performance of applications such as automated dispatch and transmission security, while enabling the integration of renewable energy, says ABB.

International

Alstom to build Kusile FGD

Alstom is to build South Africa's first wet flue gas desulphurisation (FGD) system after receiving a contract worth €160 million from Eskom.

Under the contract, Alstom will engineer, supply and install six wet limestone FGD plants for the six new 800 MW coal fired boilers at the Kusile power plant. These systems will remove more than 90 per cent of the sulphur oxide generated in the boilers, making Kusile the most environmentally-friendly coal-fired power plant in sub-Saharan Africa.

"Alstom's FGD systems will contribute to the sustainable development of South Africa by enabling Eskom to generate electricity from local coal, using the most advanced desulphurisation solution in the market," said Andreas Lusch, Senior Vice President at Alstom Power.

Alstom will execute the contract in consortium with Cosira, a major structural steel fabrication, mechanical and piping construction company in South Africa.

GE signs $700 million Saudi deal

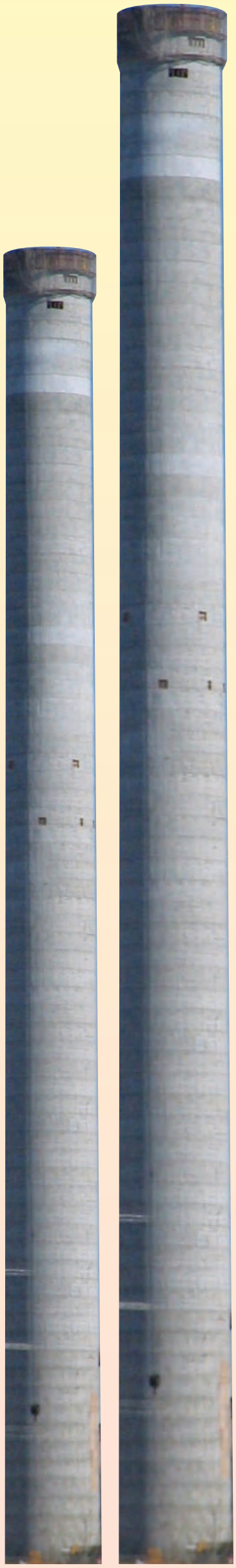
GE has signed agreements worth approximately $700 million to supply power generation equipment and long-term services for a new gas-fired, independent power plant that will help Saudi Arabia meet a growing need for residential and industrial power.

The new project – Riyadh PP11 – will add nearly 1730 MW of power to Saudi Electricity Company's (SEC's) grid and will account for 15 per cent of the power generation capacity in Saudi Arabia's central region. GE will supply seven Frame 7FA gas turbines and two D11 steam turbines.

In addition to providing the equipment, GE has also signed a contractual services agreement (CSA) and will supply spare parts and maintenance services for the gas turbines over the next 20 years.

"As the first gas turbine independent power plant for SEC, the Riyadh PP11 project reflects our strategy to engage the private sector in the development of new power plants and to adopt innovative energy technology to increase the efficiency of our power production," said Eng. Ali Saleh al-Barrak, president and CEO of SEC.

Shipment of the equipment for Riyadh PP11 will begin in 2011. The first phase of the project, totalling 788 MW, is scheduled to enter commercial operation in mid 2012, while the second phase, totalling 941 MW, is scheduled to enter full operation by mid 2013.



Beyond baseload bias: a new approach to valuing generation assets

As the UK accelerates efforts towards decarbonisation of the power sector, wider penetration of variable renewable energy will change the pattern of power prices and how conventional plant operate, driving a shift in earnings expectations for both new and existing thermal plant.
Phil Grant explains the impact of these changes and why investors need to rethink the way that generation assets are valued and financed.

For many years, investors and financiers have relied on forecasts of baseload prices and spreads to evaluate their decisions to invest in thermal power generation plant. This approach has worked well in the past because new plant has largely been expected to operate at – or close to – baseload levels for a large portion of their financing period. However, with the rapid growth of low marginal cost renewable generation, even new highly efficient plant may be forced to run at lower and variable output levels soon after commissioning.

Investors in thermal plant are now asking whether prices will rise sufficiently in the periods when they are running – when renewable output is relatively low – to compensate for lost earnings from reduced overall output. Redpoint Energy's modelling suggests that there will be a marked change in the pattern of wholesale electricity prices in Great Britain market as large volumes of variable renewable capacity are connected to the system. In particular, prices tend to become more volatile and spike and trough more frequently.

By earning a higher spark spread during the hours when it is operational, the plant could still be profitable despite operating at a lower annual load factor. As an illustration, a new combined cycle gas turbine (CCGT) operating at baseload levels – 8000 hours a year (around 90 per cent of the time) – needs to secure an average spark spread of around 12 £/MWh to deliver a reasonable return to investors. But if the same plant is only operating for half that period it would need to earn on average 24 £/MWh for every hour that it operates to make the same return. Provided prices frequently spike when capacity margins become tight due to low renewables output, our modelling suggests that plant could achieve the required earnings levels even operating at lower load factor.

However, there is a higher risk associated with the earnings profile when operating at lower load factors. The economic viability of generating plant becomes increasingly dependent on plant owners being able to dispatch their plant to operate in the hours with higher spark spreads. Badly timed maintenance scheduling or unplanned outages occurring could mean the plant misses out on a few highly profitable hours of operation which are critical to delivering a reasonable return for the investors.

All of this is dependent on market arrangements that reveal scarcity value of power in periods of tight supply, and allows prices to rise up to the point that consumers would prefer to switch off, even if for only a few hours of the year. As Ofgem pointed out in its Project Discovery consultations, this has not necessarily been the case under the current arrangements. In May 2008, a sudden loss of 1.6 GW of generation led to the system being very short and National Grid had to reduce voltage and disconnect some loads to maintain system security. Despite this 'near miss' prices in the Balancing Mechanism reached only 313 £/MWh. This suggests that peak power might be undervalued under the current arrangements, and the anticipated price spikes associated with periods of low renewables output might not be high enough for thermal assets to earn the return they need.

The ability of plant to turn on and off rapidly and frequently in response to price movements will become an important determinant of asset value. This shift in outlook is already in evidence as developers and asset owners seek more flexibility in their asset operation from equipment manufacturers and maintenance providers, in some cases putting more value on flexibility than maximising thermal efficiency.

Rather than relying on superior thermal efficiency to secure the required spark spread, the investment case for new CCGTs will become increasingly dependent on securing value through flexibility. Consequently, in future the revenues for generating plant may become more diverse with a shift away from the wholesale market towards earnings derived from the exploitation of market volatility or maximising revenues from the provision of balancing services – the demand for which may increase with increasing proportions of variable renewables on the system. The more flexible plant is, both contractually and technically, the greater the earning potential for the asset to earn revenue away from the wholesale market.

The size of the additional income sources will vary according to plant configurations and will be different between owners. Vertically integrated utilities will increasingly derive value from flexible generating plant to self-balance against a varying retail portfolio and against an increasingly variable generation portfolio.

Phil Grant: the baseload spark spread may no longer be sufficient to justify new CCGT build

Independent players, on the other hand, may need instead to monetise the flexibility in the generation asset by selling options to suppliers or renewables generators looking to manage their volume and price risk, or by providing balancing services to the system operator.

Nonetheless, for investors in potential new plant, a robust analysis of these additional revenues streams will be paramount in demonstrating a compelling investment case. The baseload spark spread may no longer be sufficient to justify new CCGT build. Whether the current market arrangements will sufficiently reward flexibility in a steadily de-carbonising power sector and deliver the additional revenue streams necessary to swing investment cases is an interesting debate that many in the industry, including policy makers, are now turning their attention to.

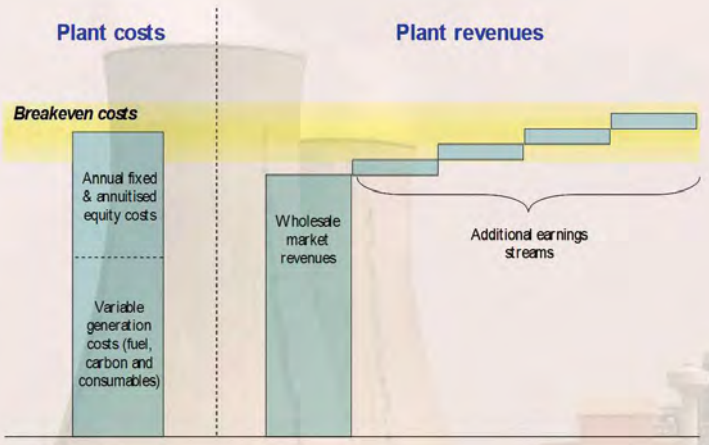
Phil Grant is Director of Redpoint Energy, a specialist energy consultancy, advising on investments, strategy and regulation across Europe's liberalised power, gas and carbon markets.

Flexible vs inflexible

Redpoint Energy has simulated the dispatch and calculated the profitability of two combined cycle gas turbine plants, assumed to be operating on a merchant basis in 2009.

The two plants have the same thermal efficiency but different operating characteristics. The flexible plant can respond rapidly to near term prices and is able to ramp up from zero to maximum capacity quickly. In contrast the inflexible plant takes longer to reach maximum capacity and, once there, is constrained to operate at that level for several hours. The inflexible plant is also more limited in the number of starts it is permitted each year, and this forces the plant to operate in periods of negative spark-spreads – to avoid exceeding its annual number of starts.

The modelling demonstrates that the annual gross margin of the flexible plant is around 15 per cent higher than the inflexible plant, although the long term operation and maintenance costs faced by the flexible plant will be higher. Hence, operators will increasingly face a trade-off between increased flexibility and higher gross margins but resulting in higher operation and maintenance charges, compared to a more stable running regime, delivering lower gross margins.

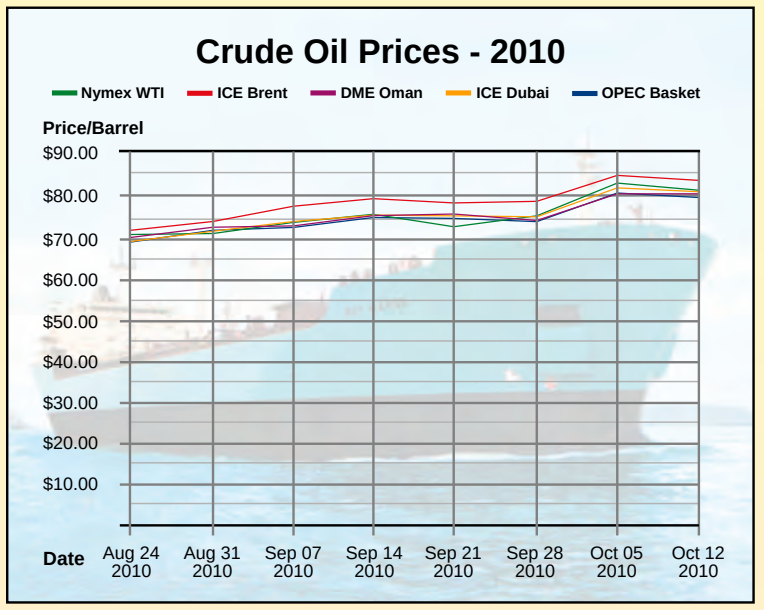


Plant costs versus potential revenues

- The diagram shows the breakeven plant costs (split between variable and fixed costs) that a generator will need to earn to make a reasonable return on capital.
- The right-hand side shows the potential wholesale market revenue streams that could be produced by a flexible generating plant.
- The diagram illustrates Redpoint Energy's hypothesis that while the wholesale market will deliver a large proportion of revenues, the additional revenue streams created by flexibility will play a growing role in the economics of new plant.

Oil

Opec concern over economic recovery and dollar



Market fundamentals remain weak ■ Countries income affected by low level of dollar

David Gregory

In recent weeks crude oil prices have settled above $80/b at their end of daily trading, prompting a number of Opec ministers to express their satisfaction with the state of the oil market during their recent gathering in Vienna.

But it now appears that prices could easily settle into a $75-85/b range. This is not because fundamentals are driving prices. Rather, crude supplies are ample and the market is being driven by economic data and to a large extent by the fluctuation of the US dollar.

Under these conditions, Opec decided to leave its production target at 24.845 million b/d for the Opec-11 (excluding Iraq). Opec-11 produced 26.6 million b/d during September and added Iraqi output brought the total to 29.0 million b/d for the month.

A number of the delegates attending the Opec ministerial conference in Vienna on 14-15 October expressed concern that the recovery may falter and the world could find itself in the grips of a double-dip recession.

Opec ministers stated in their communiqué that "whilst economic recovery is under way, there is still considerable concern about the magnitude and pace of this recovery, especially in the major industrialised countries of the OECD. Moreover, whilst there has been some easing of the overhang in crude oil stocks, market fundamentals remain weak, refinery utilisation rates are low and product inventories have risen considerably."

Clearly, allowing the price of crude oil to rise without the fundamentals to support it poses a risk but it is one that Opec as a whole is willing to take.

Opec Secretary General Abdullah al-Badri told a news conference in Vienna that a crude oil price of $75-85/b would not harm the economic recovery.

"Now we are entering growth because we went through a very, very bad recession," Badri said, adding: "Opec does not want to hinder that growth. We think $75-85/b will not hinder the growth of the economy. What really concerns us is the value of the dollar, because member countries' income is being affected by this low level of the dollar."

In the latest issue of Opec's *Monthly Oil Market Report (MOMR)* the group expressed its concern about the recovery, saying that it "remains at a critical stage." The *MOMR* said: "The uncertain pace of global growth as well as weak conditions in oil market fundamentals could pressure price," adding: "While fiscal stimulus is coming to an end in almost all economies, monetary easing is expected to continue. However, the effectiveness of further quantitative easing is uncertain. With respect to the dollar-euro exchange rate, continued increases in US money supply could further weaken the dollar."

Concern over the value of the dollar prompted the usual price hawks – Libya, Algeria and Venezuela – to call for a crude oil price of $100/b. Their point is that economic recovery and a weaker dollar require a higher oil price. The chairman of Libya's National Oil Corporation and de facto oil minister, Shukri Ghanem, the price of oil needed to rise "because the dollar is getting eroded, the price of commodities, particularly food and wheat are high. Subsequently we are losing on our real income. We like to see a higher price up to $100 dollars."

When the dollar is cheaper, it boosts demand for oil among those buyers that are making purchases with other currencies as crude is less expensive to buy when the currency is exchanged.

Opec leader Saudi Arabia has a different take on the situation. Minister of Petroleum Ali Naimi told reporters in Vienna that a price between $70-80/b is "ideal."

"We are comfortable with the whole market today," Mr. Naimi said. "The economic growth of the world has been remarkable in 2010."

For its part, the Paris-based International Energy Agency (IEA) forecast that demand for crude oil would grow by 300 000 b/d during 2010 and 2011. It said in its latest *Oil Market Report* that due to stronger than expected readings during the third quarter of 2010, global oil demand would average 86.9 million b/d in 2010 (an increase of 2.5 per cent or 2.1 million b/d year-on-year) and 88.2 million b/d in 2011 (an increase of 1.4 per cent or 1.2 million b/d over 2010.)

Gas

Leviathan well could impact east Mediterranean energy

Drilling has begun at the Leviathan-1 well. Should the well prove as successful as expected, the natural gas reserves offshore Israel will allow it to become an energy exporter.

Mark Goetz

Drilling got under way at the Leviathan-1 well offshore Israel in mid-October. Operated by US oil company Noble Energy, the Leviathan prospect could have a major impact on the eastern Mediterranean energy scene if it does indeed prove to hold 16 trillion cubic feet (tcf) of natural gas as estimated.

Noble Energy is using the Sedco Express rig to drill the Leviathan-1 well, which is located some 135 km off the coast of Haifa in 1634 m of water. Drilling will take five months and cost $150 million.

The discovery last year of the Tamar field has the possibility to provide Israel with all its natural gas needs for 20 years or more at the current rate of demand. Should Leviathan prove as successful as expected, the natural gas reserves offshore Israel will allow it to become an energy exporter.

Development of the Tamar field was sanctioned by Noble Energy last month following approval of the plan by the government a few weeks prior. Development costs are estimated at $3 billion and Tamar is to begin piping natural gas to Israel's facilities at Ashdod at a rate of about 1 billion ft^3 (bcf) per day by the end of 2012.

The Tamar discovery and the subsequent announcement that the Leviathan structure could put Israel's offshore natural gas reserves at nearly 25 tcf (690 billion m^3) has generated excitement within the region.

Furthermore, a recent study carried out by the US Geological Survey of the Eastern Mediterranean's Levant Basin estimated recoverable crude oil reserves at 1.7 billion barrels and recoverable natural gas deposits of 122 tcf (3.4 trillion m^3).

Positive results from Leviathan can be expected to heighten interest in Cyprus' offshore blocks among the international oil companies (IOCs). Nicosia held its first bidding round in February 2007, but awarded only one block as a result – Block 12 to Noble Energy and that block is adjacent to Noble's Israel acreage. Cypriot officials say a second bidding round for a dozen offshore blocks is likely to happen sometime in 2011. By that time, Leviathan's reserves will be known.

The discoveries and activities offshore Israel has prompted Lebanon's parliament to pass a hydrocarbon law that could allow it to begin tendering offshore prospects in 2012. Yet there remains much to be done in the sector and there are questions as to whether Lebanon's tumultuous politics will enable matters to progress.

To some degree, the offshore discoveries could well become another bone of contention between the two states, which remain technically at war. Lebanese politicians have claimed that the structures that Israel has identified extend to within Lebanon's offshore territory and the government has written to the United Nations requesting that it identify the offshore zones.

No such dispute exists between Israeli and Lebanon over the maritime border. Cypriot officials have said that recent discussions with Israel find both sides in agreement with the delimitation of their respective exclusive economic zones (EEZs).

Israel's offshore activity has generated controversy within Israel itself, as the government – stunned and pleased by the country's energy promise – is expected to introduce legislative measures to increase the percentage of royalties that companies will have to pay. Royalties are now 12.5 per cent based on a law passed in 1952. The Knesset is proposing that the rate be raised to 20 per cent – a move opposed by Noble Energy and Israeli oil companies that have made large investments during years of searching.

But a number of Israeli MPs are arguing that it is only fair for the state to receive a larger percentage considering the size of the discoveries and the future production and revenue potential. Included in the debate is whether the royalties should be made retroactively or only for new licenses.

The issue is being examined by the Sheshinski Committee, which is charged with examining Israel's policy on royalties from natural resources. It is due to make its preliminary recommendations in mid-November and issue a final report by the end of the year.

One of the key concerns within the Knesset is whether an increase in royalties will act as a disincentive to foreign investment. By comparison with the royalties paid to other governments, 12.5 per cent is no large amount. But much is likely to depend on the output of the Leviathan-1 well. If it is as big as estimated, an increase in royalties may not pose such an obstacle to foreign investors – and foreign investment would provide Israel with not only working capital but a political buffer in a part of the world where politics usually comes first.

The global gas challenge

Many are hailing shale gas as a global game changer but there are significant challenges and constraints that could hinder a replication of US success in other parts of the world.

Dale Nijoka

The boom in unconventional gas production in the US has transformed the energy outlook there and ignited interest from across the globe. There is no doubt that shale gas is the hot topic in the energy industry, with many positioning it as a global game changer. Nonetheless, the reality is that the degree of uncertainty over the level of future gas demand is probably at its highest in decades.

According to the International Energy Agency's (IEA) *World Energy Outlook 2009*, global gas demand is forecast to grow by an average of 1.5 per cent per annum through 2030, with the majority of the growth coming from non-OECD countries. However, the actual growth in gas demand will be influenced by a number of unpredictable factors including the strength and speed of economic recovery, future gas prices, government energy and environment policies and the impact of new technology.

Future gas supplies are equally difficult to predict. The world's proven gas reserves are estimated by the IEA at 180 trillion cubic metres, with unconventional gas accounting for 4 per cent of that total. Unconventional gas resources, a term that covers shale gas, tight gas and coalbed methane, could be considerably higher than the IEA estimate but the impact they will have on local and international markets is not yet clear.

Few would argue against the fact that shale gas, in particular, has the potential to transform the global gas market but there are significant challenges and constraints in place that could hinder a replication of US success.

The key elements in the emergence of shale gas development and production have been the refinement of cost effective horizontal drilling and hydraulic fracturing (fracking) technologies. These two processes have allowed shale gas development to move into areas that previously would have been inaccessible and uneconomic.

According to the US Department of Energy (DOE) report: *US Proved Reserves of Crude Oil, Natural Gas, and Natural Gas Liquids Annual Report 2008*, published in November 2009, proved US shale gas reserves at the end of 2008 were estimated at 32.8 trillion cubic feet (tcf), a little more than 13 per cent of total US natural gas reserves. However, proved reserves of shale gas are thought to be relatively small in comparison to total technically recoverable reserves. Shale gas resources have been identified across much of the US lower-48 states but 66 per cent of the estimated total reserves are located in Texas.

US shale gas production in 2008 was estimated by DOE to be about 6 billion cubic feet per day (bcf/d), with almost two-thirds of that coming from Texas. In its latest long-term energy forecast (*Annual Energy Outlook to 2035*, published in December 2009), the DOE expects shale gas production to reach more than 12 bcf/d by 2020, and almost 17 bcf/d by 2035.

Current US shale production growth is depressing short-term gas prices in North America. Prospects for continuing or even more rapid growth in production, both in North America and potentially elsewhere, are also pressuring mid and longer-term price assumptions. Growing shale and other unconventional gas production will likely displace LNG in North American markets and shale gas is expected to be particularly competitive to higher cost LNG in the Atlantic Basin.

The main factor likely to inhibit projected growth in shale gas production is new environmental legislation. In particular, regulators and policy makers are concerned about possible threats to local water supplies and public health as a result of hydraulic fracturing and a comprehensive study, which could take up to two years to complete, is currently being undertaken by the US Environmental Protection Agency. Investment in shale gas developments may dry up if hydraulic fracturing were to be outlawed or significantly limited as a result of the findings of the study. For the government, the key is finding the right balance between energy security, self-sufficiency and environmental issues.

Environmental concerns with regard to shale gas development were also recently heightened by two separate well blow-outs in the Marcellus Shale, one in western Pennsylvania, the other in West Virginia. While quickly contained and with no injuries and only minimal damage, the two incidents came at a particularly inopportune time for the industry, given the public outcry for more regulatory oversight on the heels of the deepwater well blow-out and subsequent, major oil spill in the Gulf of Mexico.

Nonetheless, in the absence of major changes to gas demand growth assumptions, the implied North American call on LNG imports has been substantially reduced and incremental cargoes that would have otherwise flowed into North America will be redirected to other markets.

Short to medium-term shale gas development will primarily affect the gas supply and demand balance in the Atlantic Basin, shifting the attention of the marginal, major gas suppliers, primarily Russia and the Middle East, to servicing Asian markets.

In other parts of the world, shale and other unconventional gas resources are present in most European countries but activity is largely focused on Poland, which has more promising shale geology. Land and licence acquisition and early-stage exploration is under way in a number of countries. Several of the oil majors that came late to the game in the US may lead a European "land-grab", which could swallow-up many of the smaller companies with local and regional shale positions.

Dale Nijoka is watching unconventional gas potential in the US, Europe and beyond with interest

Russia stands to be particularly challenged by the shale gas boom. Along with other Atlantic Basin gas suppliers, Russia's Gazprom now finds that the prospects for a strong mid-to-long term market for LNG imports into North America are greatly diminished. First gas from Gazprom's Shtokman LNG development is now targeted for three years later than originally planned.

A number of other high cost developments targeting Atlantic Basin gas markets are also being delayed by industry participants. Russia's strategic gas focus is likely to shift from "west" to "east" as Gazprom looks to develop gas fields and the infrastructure to supply domestic customers in Russia's remote Eastern regions and to target new customers in Japan, China and other Asian countries. However, as Russia has the world's largest reserves of conventional gas it will continue to be an important supplier to European markets.

The environmental credentials of shale gas will be an important issue. Government policies directed to protection of the environment, whether unilateral or part of wider global agreements could help promote greater use of natural gas. Natural gas is a cleaner burning fuel than coal or oil. According to the International Gas Union, when burned, it releases up to 50 per cent less carbon dioxide than coal and 20-30 per cent less than oil. However, while natural gas is widely acknowledged to be a cleaner alternative to other fossil fuels, the adoption of natural gas on environmental grounds has been limited to date. To some extent that may have been due to affordability issues but that is likely to change as governments in many nations look to reduce their carbon emissions.

To meet global emissions reduction targets, the use of coal in power generation and oil-based products in transport fuels will need to be replaced to some degree by cleaner fuels. This requires evaluation of the relative merits of alternative fuels for power generation: natural gas, nuclear and renewable sources.

Until a couple of years ago, it was more expensive to produce a kilowatt of electricity using natural gas compared with coal, and gas-fired power plants were primarily used to meet peak loads. But gas-fired power plants have some advantages over coal and nuclear plants, namely that they are quicker to build and that it is relatively trouble-free to gain regulatory approvals. Natural gas should be considered as complementing renewable sources as fuel for power generation. Renewable energy sources, which are intermittent in nature, need to be supplemented by base load power generated from fossil fuels or nuclear energy. Ultimately the decision on choice of fuel for new power plants will boil down to issues of relative availability, affordability and environmental acceptability.

Whether shale gas is a global game changer remains to be seen. It is clear that shale gas holds the potential to change the global energy industry but the complexity of the operating environment and the considerable challenges to be overcome mean that the outcome remains uncertain. In the meantime, many within the energy industry will watch developments in realising the unconventional gas potential in the US, Europe and beyond with interest.

The main factor likely to inhibit projected growth in shale gas production is new environmental legislation

However, there are a number of challenges to exploiting the shale gas potential in Europe, which mean that it may not offer the same promise as in the US. The higher population density in Europe may make many stages of the operation more difficult. While companies operating in Europe may learn from experiences in the US in terms of operations, opponents may attempt to block developments by highlighting US examples of environmental impairment.

In addition, sub-surface mineral rights tend to be owned by the state in Europe and there is a dearth of drilling rigs and other equipment required for shale gas development in Europe. For example, Europe has around 50 onshore gas-drilling rigs in operation at any time, compared with up to 2000 in the US. Finally, extracting gas from shale is a complicated process, and what has been learned in North America may not be directly transferable to Europe.

Dale Nijoka is Global Oil and Gas Leader for global consulting company Ernst & Young

A superconducting 'SuperStation'

What appeared to be a technically and economically ambitious project when it was announced last year, requiring the very latest in transmission and distribution technology, is gradually taking shape in New Mexico. **Junior Isles**

Just over a year ago, Phil Harris, CEO of Tres Amigas LLC outlined his concept to build the Tres Amigas "SuperStation" to link the three power grids of the US and create the nation's first renewable energy market hub.

Since the project's announcement, there have been a number of developments, including significant interest from transmission companies to connect into the SuperStation. At the time of Tres Amigas' initial FERC filing in October, 2009, five transmission companies – Public Service Co. of New Mexico, ITC, Excel Energy, American Electric Power and Sharyland Utilities – submitted letters of intent, subject to further due diligence, to connect to Tres Amigas. Since then, additional utilities and merchant developers have submitted enquiries, which are now in negotiation.

The vision is for the Tres Amigas SuperStation to tie together America's Eastern Interconnection, the Western Interconnection and the Texas Interconnection (also known as the Electric Reliability Council of Texas, or ERCOT) for the first time to enable faster adoption of renewable energy, and increase the reliability of the grid.

While the project is strategically important, it also has tremendous significance from a technology standpoint, as it will demonstrate one of the many possible applications for superconductors in the power industry.

Jack McCall Director HTS T&D Systems at American Superconductor (AMSC) commented: "The use of superconducting cables in Tres Amigas really does help underscore the maturity and significance of superconductor cables in the industry. It's a pretty spectacular move on Phil's part."

The project requires gigawatt-scale underground cables and power conversion systems that can serve as access points for each of America's interconnections. According to Harris, this made superconductor electricity cables "a natural fit" for the Tres Amigas SuperStation.

AMSC also saw the project as a fit. The company spent $1.75 million for the purchase of a minority stake in Tres Amigas, LLC and is also expected to provide transmission planning services, superconductor wire and the superconductor cable system for the project.

The project will demonstrate the importance of superconductors in high voltage applications. In the US there are currently about nine HVDC links between the three grids, stretching from Canada almost down to the Mexican border, with a total power rating of just over 1 GW. This means there is limited power transfer capacity. McCall commented: "Tres Amigas will initially increase this transfer capacity to 5 GW, with an ultimate vision of 30 GW."

The Tres Amigas renewable energy market hub will be constructed in Clovis, New Mexico. This location was chosen for several reasons. It has easy access to all three of the nation's power grids and in particular transmission lines that are designated to moving wind power around Texas.

Locating it outside of Texas also simplified things from a regulatory point of view. Transmission lines that connect to Tres Amigas from ERCOT will not come under the jurisdiction of FERC, making it easier for Tres Amigas to be operated as a merchant transmission entity. "New Mexico has proven to be easy to work with in terms of identifying land and making land available at reasonable prices," added McCall.

Tres Amigas SuperStation essentially consists of three stations located about 3 km apart, with each station comprising multiple DC terminals. Multiple power transmission lines from each of the interconnections will feed power into and out of the SuperStation through multiple AC/DC converters, each connected by DC superconductor cables.

The SuperStation has to act as an active, dynamic trading hub where it must be possible to change the active power flow between regions as necessary. For example during the day when there is abundant solar power in the southwest, there would be a need to move power from west to east. At night when wind generation is higher, power would need to flow west. Power flows would also alter according to the different peak demands of the different time zones.

Conventional DC technology, which typically only allows power to flow in one direction, was therefore not a real option.

Voltage source converters (VSCs) are the only technology capable of changing the direction of power flow millisecond by millisecond in a multi-terminal application. Compared to conventional HVDC technology, VSCs are more self sufficient from a reactive power standpoint and are therefore more compact – they do not require large filter capacitors and reactor banks to provide reactive power compensation.

American Superconductor's Amperium wire conducts more than 100 times the electrical current of equivalent sized copper wire. As a result, the few Amperium wires pictured on the right are able to carry as much power as all of the copper on the left. The Tres Amigas SuperStation will incorporate direct current (DC) Superconductor Electricity Pipelines utilising Amperium wire.
Courtesy of American Superconductor Im_9WIRE

There are a handful of manufacturers that can supply this technology to handle DC voltages of 200-345 kV, depending on the manufacturer. In order to allow competitive bidding between all manufacturers, it was decided that the voltage level would be set at 200 kV. However, this would call for a 12500 Amp DC bus between the three stations to transmit 5 GW.

Having a station with a transfer capacity of 5 GW creates another dilemma in terms of the number of AC transmission lines that would have to come into the station. The highest voltage in Texas is 345 kV, which means typically a transmission capacity of about 600-800 MW per line. This would require as many as a dozen lines for 5 GW. The Western Interconnection is limited to 345 kV and 500 kV lines. Only the Eastern Interconnection has lines of 765 kV, which can transfer 1.5-2 GW of power.

McCall commented: "This meant Tres Amigas was looking at a scenario where there would potentially be dozens of lines coming into the superstation. With the likelihood of tornadoes and snow and ice storms in the region, it wasn't desirable to have all of these lines in one location where a storm could have a very significant impact."

The challenge of possibly needing such a high current DC bus and so many transmission lines converging in a single location led Tres Amigas to consider superconductors. McCall explained: "For the high currents that are necessary, superconductors are the ideal conductor. They have zero resistance and zero power losses when transmitting DC. In this case, you can move 12500 Amps around this 9-10 km loop in a single cable with virtually no power losses, other than the losses that are due to the refrigerators that are needed to keep the cables cold. But these power losses are still small compared to the losses associated with conventional technologies. In addition, the superconductor cable can be placed underground."

The DC terminals within each of the three stations will be connected in parallel to each other and to the superconductor cable through a single connection point.

Notably, as Tres Amigas will act as a load balancing authority, the SuperStation will also make use of storage batteries to assist with load balancing. "Tres Amigas will be legally obligated to ensure there is a balance of power. Since power flow will come largely from renewable sources, Tres Amigas decided to put some battery storage on each of the three DC terminals. The storage will act as a bit of a shock absorber for momentary power imbalances. It will also offer the opportunity to store some power for resale via ancillary service contracts."

AMSC has designed the superconductor cable system and is currently evaluating designs from cable manufacturers around the world.

McCall said: "We will be looking at the technical merits of each design, e.g. how the cable and terminations will be built, what will be the refrigeration requirements etc. The refrigeration is a significant portion of the system costs, perhaps 15-20 per cent of the cost of the superconducting system."

But the cost of the superconductor system will be a "drop in the bucket" compared to the overall cost of the SuperStation. With HVDC terminals typically costing $160 000-180 000 per MW, estimates for the entire project have been put at $1-2 billion. However, because of the modular nature of the VSCs, the entire 5 GW of all three stations does not have to be built straight away; it can be executed in stages as the different transmission lines connecting into the station are constructed.

Tres Amigas has made a number of announcements this year that bring the project closer to reality. Last month, Alstom Grid was awarded the contract for the supply of the VSCs.

The engineering firm has been selected, as has the battery supplier and the company that will design, build and operate the power trading platform. As yet, there has been no announcement on the DC terminal suppliers and AMSC has not yet selected who will supply the superconductor cables.

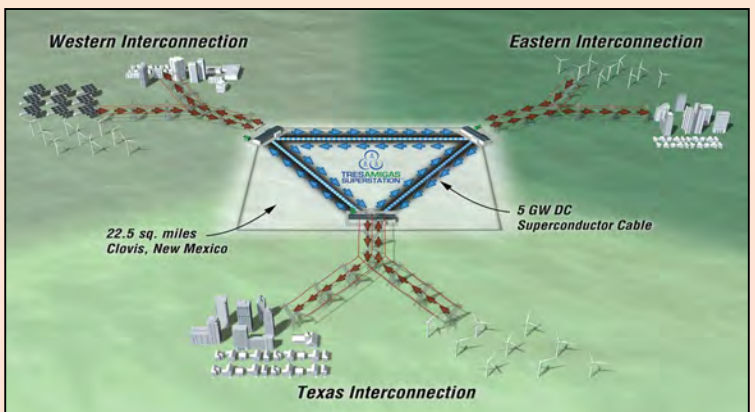
In late August, Tres Amigas initiated the study and regulatory processes necessary for the first key interconnections. In particular, Tres Amigas requested that the Southwest Power Pool (SPP) execute an interconnection agreement to enable Tres Amigas to interconnect to SPP. Tres Amigas is seeking a similar interconnection agreement with Public Service Co. of New Mexico (PNM) and the broader Western Electricity Coordinating Council (WECC). These interconnection agreements are expected to be finalised early in 2011.

Once there are firm commitments from transmission companies to build lines into the SuperStation, the next step will be to sell-off the capacities of the station. This will allow Tres Amigas to obtain financing to start building the SuperStation.

Some would argue that such a project presents a high financial risk, but McCall disagrees. "In a merchant transmission project, you are auctioning off a number of things. You are auctioning the transmission capacity of the line and you can also charge for the individual transaction of shipping the MWh across the line. In addition, there are a range ancillary services that can be packaged and sold. So there are plenty of financial vehicles if you look at it as a series of merchant lines. The calculations show it is definitely a financially viable project."

Hopefully, the belief in the financial viability of the project will allow this visionary project to become a reality.

> The use of superconducting cables in Tres Amigas helps underscore the maturity and significance of superconductor cables in the industry



Tres Amigas SuperStation essentially consists of three stations located about 3 km apart, with each station comprising multiple DC terminals

Junior Isles

From birth control to recession

Unless the world population stops increasing, man-made carbon dioxide emissions (CO_2) will also continue to rise. And with mandatory birth control not being an option, it seems we are on a hiding to nothing in efforts to reduce greenhouse gas emissions and thus slow down climate change. But there is no need to throw in the towel just yet.

Speaking at the European Turbine Network (ETN) conference in Brussels, Professor Samuele Furfari, adviser to the Director General of DG Energy in the European Commission commented: "The production of CO_2 is the result of the number of people in the world. But as birth control is not the topic of this conference we will have to look out how we produce energy."

Progress, even if somewhat slow, is being made on achieving long-term (2030-2050) targets for renewable energy and the transition to a low carbon economy. The question is: what happens between now and the 2050 timeframe?

Many believe that gas, whether natural or unconventional, is the answer. The discovery of unconventional gas, according to the International Energy Agency (IEA), means that the world may now have 250 years of gas reserves at the current rate of consumption. Speakers and delegates at the ETN conference, however, challenged whether it should be seen simply as a transition fuel.

Hans van der Loos, Head of the European Union Liaison at Shell International said he is "concerned that gas does not have as big a role as it should have" in Europe's integrated energy plan. While he noted that every tool would be necessary to keep global GHG concentrations to 450 ppm – the level needed to limit the global temperature increase to 2ºC – he also insisted that natural gas was a "triple-A destination fuel, not just a bridging fuel".

Certainly gas fired generation has a number of benefits. Gas is abundant and is also largely environmentally acceptable.

Van der Loos argued that the quickest way to reduce CO_2 is to replace coal fired power plants with gas fired plants. He also said that in these tough economic times, "value for money considerations" should be given a higher priority by policymakers.

While he believed that policymakers should "one way or another, set the right framework for low carbon investment", he said they should not try to pick technology winners.

This was echoed by Professor Furfari who said politicians should not try to be engineers. "Sometimes politicians try to find the rabbit in the hat but forget that they have no hat," he joked. He also acknowledged the importance of gas, noting that there was plenty of gas in regions such as the Caspian, Russia and Iraq and that Europe needed to import more gas. He was, however, wary of increased imports of gas, pointing out that the EU's hope of importing 200 billion m^3 of gas will result in an increase of 393 million t of CO_2 i.e. an increase of 8.6 per cent.

> ... natural gas is a "triple-A destination fuel, not just a bridging fuel"

Gas fired power generation is also seen by some the "best partner" for renewables since it can provide backup for the intermittency of renewables such as wind and solar.

There is also the promise of zero CO_2 power generation with gas through the incorporation of carbon capture and storage (CCS).

The importance of CCS is clear. The IEA notes that without CCS, the cost of meeting the 2050 emission targets will be 70 per cent higher than without CCS. The first applications of CCS will be on coal fired plants since that is where it will have the highest impact, but many industry observers believe that it will also eventually be needed for gas fired plant.

Joseph Strakey, Chief Technology Officer at the US Department of Energy's National Energy Technology Laboratory, said there would be a need to decarbonise 50 per cent of gas fired generation in 2030-2050. He said that with the shale gas discoveries, that figure could be even higher.

Low gas price is seeing another dash, at least in the US and Europe where there has been a definite move towards gas fired generation. "The US utilities are looking hard at combined cycle gas turbine plants," said Strakey.

The cost and complexity of adding CCS to gas fired plants is prohibitive. Van der Loos argued that the current cost of gas power plants including CCS is still 20 per cent cheaper than offshore wind technology. This may be true, but is still far higher than utilities are prepared to swallow.

Earlier this year Statoil put the brakes on its Mongstad project saying it is too complicated and the technology too new to make a 2014 start-up feasible.

Nevertheless, Strakey believed that rapid deployment of CCS was necessary and that was "why the US is spending so much money on it".

Strakey admitted there is a "cost problem" with CCS explaining that it adds about 73 per cent to the cost of electricity in a supercritical coal fired plant.

The US currently has 10 CCS power projects at various stages of development. Notably, three of them are IGCC-CCS projects.

Strakey believed that the levelised cost of electricity from an IGCC plant with carbon capture is about the same as that for a supercritical coal fired plant with capture. He also said that costs could be reduced so that they are no more than the costs of an IGCC plant without capture today.

Most of the spending in the US in terms of gas turbines to be used in CCS projects is on developing an advanced hydrogen-fueled gas turbine that will operate at F-/H-class conditions in an IGCC application that employs CCS. He felt that the efficiency of such a turbine could be 3-5 per cent better than today's gas turbines. Achieving this goal will recover much of the performance penalty incurred in today's baseline IGCC with CCS.

Opting for IGCC plants with CCS offers plant owners a degree of fuel flexibility. This has been the thinking behind the Magnum IGCC-CCS project being developed in the Netherland's by Nuon, now owned by Vattenfall. The plant could burn coal, biomass or natural gas. The first phase of the project, which has been approved will see the plant built as a gas fired CCGT project. The decision on whether to convert it to IGCC with CCS will be made at a later date.

Yet CCS will prove to be a two-edged sword for utilities with gas fired plants. Although it will result in near zero emissions, it will rob them of the flexibility that is so useful in complementing wind generation. Finding a balance between ancillary services, security of supply and emissions will be no easy task for operators and politicians alike.

Of course not using energy, at least unnecessarily, in the first place is the best way to reduce GHG emissions. According to the European Environmental Agency, the exceptionally deep recession of 2009 affected all economic sectors in the EU and saw consumption of fossil fuels (coal, oil and natural gas) fall by 5.5 per cent in 2009 compared to the previous year. This, combined with an increase in renewables, resulted in EU GHG emissions decreasing by 6.9 per cent in 2009 compared to 2008.

As Furfari quipped: "The consequence of the economic turndown is evident – we have reduced our energy consumption dramatically. If we want to reduce our energy consumption, then recession is the best tool."

It is comforting to know that we have another tool if technology fails to deliver on carbon reduction. If all else fails, the bankers can always be called in to kick-start another recession.