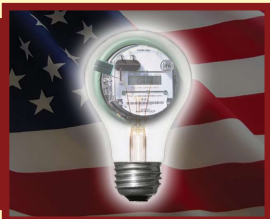


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# IEA outlines cost of combating climate change

Nobuo Tanaka:  
IEA Executive Director



A recent report by the International Energy Agency has outlined the technology investment costs of combating climate change. The report will provide guidance to climate change negotiators that have yet to commit to any budget to finance clean technology, **writes Junior Isles**

The International Energy Agency (IEA) says that a \$10 trillion investment in renewable energy, biofuels and nuclear power is needed over the next 20 years in order to stabilize greenhouse gas emissions.

The IEA recommends that most of the spending until 2020 goes into increasing energy efficiency, renewable energy and biofuels. In the following decade, more should be directed into nuclear power and carbon capture and storage (CCS).

The organization said if the money were invested in the right technology, leaders would succeed in preventing temperatures from rising 2°C above pre-industrial levels – the threshold at

which most scientists say serious climate change will occur.

Under the IEA's latest recommendations, 33 per cent of energy would come from renewables, including nuclear power, by 2030 – about three times as much as today's 18 per cent. This would require the construction 18 nuclear reactors and 17 000 windmills ever year. At the same time, around 60 per cent of vehicles worldwide would have to be either hybrid or electric.

In a separate document, the agency also proposed that 100 CCS projects should be implemented by 2020, calling for an investment of \$42 billion over the next 10 years. It said 3400 projects would be needed by 2050, requiring

between \$2.5 trillion and \$3 trillion of additional global investment. "The carbon capture and storage projects need to be tested in OECD member countries first before diffusing to non-OECD members," IEA Executive Director Nobuo Tanaka said at an IEA ministerial meeting.

The IEA recommendations on investment in low-carbon technology come at a time when UN climate negotiators are working to craft a new global climate change accord that would replace the Kyoto Protocol. The Kyoto Protocol expires in 2012 and world leaders are hoping to forge a new deal next month at the COP15 meeting in Copenhagen.

But negotiators from industrialized countries have yet to commit to any budget to finance clean technology and the other measures needed to move to a low-carbon economy. They also have not agreed to the deep emissions cuts that the IEA plan endorses.

The agency said industrialized countries should finance three-quarters of its plan and more than 40 per cent of the money should be spent in poor countries. Most of this would be in China, the world's biggest emitter, which the IEA estimates could account for about a third of global emission reductions by 2020.

The Paris-based agency, which

*Continued on page 2*

## Arab countries advance nuclear

### ■ UAE signs nuclear law

### ■ Jordan launches site studies for first nuclear plant

The United Arab Emirates and Jordan both took important steps last month in their plans to develop civil nuclear power programmes.

The president of the UAE signed a law regulating the development of a civilian nuclear programme, clearing the way for construction of a nuclear power plant with help from the US.

Washington has promoted its plan to help the UAE develop peaceful nuclear power as a model of the kind of cooperation it would like to achieve with Iran.

UAE President Sheik Khalifa bin Zayed Al Nahyan signed into law the regulatory framework for building "a peaceful nuclear energy sector," the country's official news agency reported.

The law complies with regulations of the UN's International Atomic Energy Agency, the state-run WAM news agency said.

Under those guidelines, the UAE will be prohibited from developing its own programme to enrich uranium or reprocess spent nuclear fuel.

In May, US President Barack Obama approved plans to help the UAE develop nuclear power to meet its growing demand for electricity in Dubai and Abu Dhabi.

Under the pact, the UAE must import, rather than produce, fuel for its nuclear reactors. The pact would run for 30 years and allow the US to transfer nuclear equipment, reactors and material for civil nuclear research to the UAE.

Meanwhile, The Jordan Atomic Energy Commission (JAEC) has launched environmental and feasibility studies for the location of the Kingdom's first nuclear power plant.

Mid-October saw the first gathering of the implementing parties of the site-selection and characterisation study, a

two-year process that will examine the proposed site, located in the southern strip of Aqaba, 9 km inland and 450 m above sea level.

The JAEC has spent the last year-and-a-half identifying potential sites for the nuclear power plant, expected to be a Generation III reactor with a capacity of up to 1000 MW.

Over the next three months, Belgian engineering firm Tractebel-GDF Suez, along with a consortium including the French company Bureau Veritas and Arab Consultants Bureau, will determine whether the site, some 20 km outside Aqaba city, will be suitable for the construction of a nuclear power plant.

If the site is confirmed to be suitable, Tractebel and the consortium will commence with the safety and environmental feasibility studies, expected to take around 18 months.

If the site is deemed unsuitable, the

JAEC will have identified alternative sites nearby in Aqaba, JAEC Chairman Khaled Toukan said, expressing confidence that the site will meet all international standards.

During the meeting, attended by French Ambassador in Amman Corinne Breuze and Belgian Ambassador Johan Indekeu, Toukan indicated that the JAEC is also considering a proposal to establish two power plants at the site simultaneously. The measure would decrease costs by 20 per cent by utilising economies of scale.

"We believe in Jordan and in Jordan's nuclear programme," Tractebel Vice President Luc Resteigne told *The Jordan Times*, noting that the Belgian firm was attracted to the "transparency and soundness" of the project.

The Kingdom currently imports 96 per cent of its energy needs, at a cost of over 20 per cent of its GDP.

*(Continued from page 1)*

serves as a policy adviser on energy issues to 28 industrialized countries, warned that if governments failed to commit to an investment capable of remaking the energy sector, greenhouse gas emissions would more than double above safe levels in the "longer term". The energy sector – which includes the oil, gas and coal used to power industry and fuel vehicles – represents 85 per cent of all global carbon dioxide emissions.

"The message is simple and stark: If the world continues on the basis of today's energy and climate policies, the consequences of climate change will be severe," said Mr Tanaka, noting that under the agency's plan, fossil fuel usage would peak by 2020 and emissions would be capped at 6 per cent above 2007 levels. "Energy is at the heart of the problem, and so must form the core of the solution," he added.

## Gridcos study UK-Norway link

UK and Norwegian electricity network operators National Grid PLC (NGG) and Statnett have agreed to explore prospects for a high-voltage power cable under the North Sea linking the two countries and offshore renewable power sources.

The direct current cable, which could become the backbone of a "super grid", would allow the two-way flow of electricity and the optimal use across both countries of new large-scale wind energy, Norwegian hydroelectric power and British thermal power, such as coal and gas-fired power stations, the companies said in a joint statement.

The link could include connection nodes along the route with spurs taking power from offshore generation – such as wind farms – and supplying low-carbon electricity to oil and gas platforms, which are heavy electricity consumers.

"This is a really exciting opportunity. Greater interconnection with Europe will be an important tool to help us balance the system with large quantities of variable wind generation in the UK, and if a UK-Norway link can become the backbone of a new North Sea super grid, it will play an especially valuable role," said Nick Winsor, National Grid's Executive Director for Transmission.

The idea of an offshore "super grid" of high voltage sub sea cables has been suggested as a way of overcoming one of the main drawbacks of wind and wave power – its intermittent and often unpredictable nature. For example, excess power supply in a windy region could be transmitted to another area experiencing calm weather.

A pre-feasibility study has suggested that the cable could be economically and technically viable. The new agreement, which runs until 2011, will allow further work to answer questions such as the optimal route for the cable and the best regulatory model.

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## Countdown to Copenhagen

# Developing countries stand firm on funding

Significant hurdles remain as the COP15 meeting on climate change approaches, one of which is the stark divide between developing and developed countries on funding to help developing countries deal with climate change, writes Junior Isles.

A new financial mechanism to help the developing world deal with the challenges posed by climate change looms as a major hurdle on the road leading up to the United Nations summit in Copenhagen in December.

Negotiators from the developing world and the developed world have only five days of climate talks in Barcelona, Spain, from November 2 - 6 to bridge the differences between the developed and developing nations before they head to Copenhagen.

Although there has been some convergence in language, there is still a wide gap between the two groups. Su Wei, chief negotiator for China was reported as saying: "In Barcelona we need to agree on financing. We have to set up a new financial mechanism that will be boosted by

public funds from the developed world."

His views were echoed by Bernarditas Muller, a leading climate change negotiator for the Philippines. "We are extremely concerned by the lack of numbers and clear funding commitments by the developed world. There is an attempt to shift the responsibility of financing to developing countries, to depend on market mechanisms and the private sector."

The source of money for three funds – to help developing countries adapt to climate change, for mitigation and a 'Multilateral Climate Technology Fund' – has exposed deep rifts. Developing world negotiators want the Copenhagen summit to endorse a package that would guarantee new

public funds for climate change beyond what the developed world gives as its current development aid.

As EU leaders prepared to kick-off a two-day summit on climate change in Lisbon, Yvo de Boer, the UN's top climate change official said that an agreement on financing at the summit was essential for a successful outcome in Copenhagen. "Developing countries need clarity on how much assistance they would receive," he said.

The text of the developing world's proposal states that "the level of new funding can be set at 0.5 -1.0 per cent of the GNP (gross national product) of industrialised countries".

The European Commission estimated that combating climate change would cost developing



Su Wei:  
chief  
negotiator  
for China

countries €100 billion a year by 2020. According to the Organisation for Economic Cooperation and Development (OECD), last year the developed nations gave close to \$120 billion in aid to developing nations.

Meanwhile, Themba Maseko, a government spokesman for South Africa said his country would only accept emissions targets if wealthy nations were prepared to subsidize the emission reduction process in poorer ones.

As the United States lags on climate legislation, China is poised to join the European Union in claiming "front-runner" status among nations going into Copenhagen.

See Final Word, page 16

# Energy lobby splits on US climate change bill

US oil and energy producers, once united in their lobbying, are now split over proposed climate change legislation, analysts say.

With natural gas producers battling oil companies and utilities disagreeing over the use of coal and renewable energy, the chances of Congress passing laws to limit greenhouse gas emissions are improved, *The New York Times* reported.

"It's much harder to pass clean energy legislation when big oil and

other energy interests are united in their opposition," explained Daniel Weiss, climate policy director at the liberal Center for American Progress.

A major split has occurred between oil companies that oppose the legislation because it would result in higher prices and some natural gas companies, which are reportedly working with the bill's sponsors to secure better treatment for their product.

A recent report called *Hidden Costs*

of Energy requested by Congress attempts to put a dollar value on the true costs of various energy sources. The report concentrates on putting a value on the damage to human health, crops, timber yields, buildings and from major pollutants such as sulphur dioxide, nitrogen oxides and particulate matter.

Sponsored by the US Treasury Department, the report assesses what economists call external effects caused by various energy sources over their

entire life cycle – for example, not only the pollution generated when gasoline is used to run a car, but also the pollution created by extracting and refining oil and transporting fuel to gas stations.

Notably, it said that pollution from burning coal to generate electricity costs the US \$62 billion a year.

The US Senate began hearings on its climate bill at the end of October but the passing of any new legislation is not expected this year.

# Global CCS initiatives gather pace

Support for carbon capture and storage (CCS) is gathering pace, with recent announcements of funding and partnerships aimed at advancing the technology.

In Australia, The Global Carbon Capture and Storage Institute (GCCSI) said it will inject of A\$3.6 million (\$3.3 million) towards ensuring the creation of the right level of knowledge and expertise to accelerate the deployment of CCS projects globally.

Announcing the funding commitment at the conclusion of the Third Ministerial Conference of the Carbon Sequestration Leadership Forum (CSLF) held on 12-13 October in London, GCCSI CEO Nick Otter said: "The Global CCS Institute recognises that there are key barriers

to the deployment of CCS that can be broken down by addressing the gaps in knowledge, skills and expertise around the world."

In a communiqué, the CSLF said the Group of Eight leading nations' goal of having 20 industrial-scale demonstration projects by 2010 was "vital" and that the pace of deployment of CCS and financing must be stepped up in developing as well as developed countries.

"There are 300 projects envisaged at the moment, but only seven are currently operational," UK Energy and Climate Change Secretary Ed Miliband told the closing session of the CSLF.

In the US, Energy Secretary Steven Chu announced the first round of funding from \$1.4 billion from the

American Recovery and Reinvestment Act for the selection of 12 projects that will capture carbon dioxide from industrial sources for storage or beneficial use. Mr Chu also said that \$55 million would be made available to develop advanced technologies that can capture carbon dioxide from flue gases at existing power plants.

The US and Canada have recently seen a significant amount of activity at various CCS pilots.

The Electric Power Research Institute (EPRI) said that it has joined with American Electric Power (AEP) and Alstom in a validation of advanced CCS technologies at AEP's Mountaineer plant in New Haven, West Virginia. EPRI will conduct independent evaluations of the CO<sub>2</sub> capture process and manage a

collaborative of utility participants.

Last month, We Energies, Alstom and EPRI also announced that a pilot project testing an advanced chilled ammonia process has demonstrated more than 90 per cent capture of CO<sub>2</sub> from the flue stream at a coal-fired power plant in Wisconsin.

Meanwhile in Canada, Capital Power Corporation said it is partnering with TransAlta and Alstom Power to develop what will be one of the world's largest CCS projects, Project Pioneer (Pioneer).

Pioneer entails the development of a CCS facility at the Keephills 3 power plant, currently under construction west of Edmonton. Pioneer will use Alstom's chilled ammonia process to capture 1 million tonnes of CO<sub>2</sub> annually.

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GE imagination at work

# Venezuela takes emergency measures

- New ministry created
- PDVSA invests in Bolivia

Siân Crampsie

Hugo Chavez has called for a 20 per cent reduction in electricity consumption to help bring an end to ongoing power cuts being experienced across Venezuela.

The Venezuelan leader has created a new Electrical Energy Ministry and has promised to create a new commission tasked with implementing energy efficiency measures. The new ministry

will be led by Angel Rodriguez, previously head of the National Assembly's Energy and Mines Committee.

Rodriguez will be responsible for solving the electricity shortages, which have been caused by a combination of low water levels at hydropower plants, a lack of maintenance and a rise in electricity demand. He will also oversee Corpoelec, the state-run power company.

Chavez has asked for air conditioners to be turned off at night and is planning to distribute energy saving lightbulbs. Power cuts and power rationing have become frequent in all parts of the country, according to local reports.

The government says that the electricity sector is essential for Venezuela's economy, which has been contracting largely due to the fall in oil prices. It is also considering the possibility of a

Hugo Chavez: calling for 20 per cent reduction in electricity consumption



nuclear energy programme and is reportedly working with Russia to detect uranium deposits.

Corpoelec says that electricity demand has been growing at 4.5 per cent per year since 2004, and will rise by over seven per cent in 2009.

Venezuelan oil firm PDVSA, meanwhile, is planning to invest some \$80 million to build a thermal power plant in Bolivia with Bolivian utility

ENDE. The 100 MW plant, being constructed in Entre Rios, will bring Bolivia's generating capacity to 1300 MW.

Bolivia is developing several new power plants in order to boost generating capacity for export to neighbouring countries. The 120 MW Misicuni hydropower project is scheduled to start operating in 2010, while the 800 MW Cachueta Esperanza hydro project is in the final stages of design.

## USA building smart foundation

- ARRA funding for smart grid training
- NY flywheel plant granted CPCN

The USA is moving forward with plans to build smart grid technologies into its electricity network as part of an initiative to upgrade the country's grid and boost the economy.

Energy Secretary Steven Chu has outlined his vision for modernizing the USA's electricity network with advanced, "smart" technologies, and has announced \$100 million in funding from the country's economic stimulus package for smart grid training programmes. Utilities and energy companies are also implementing smart grid demonstration programmes.

"America cannot build a 21st Century energy economy with a mid-20th century electricity system. This is why the Obama administration is investing in projects that will lay the foundation for a modernized, resilient electrical grid," said Secretary Chu. "By working with industry leaders and the private sector, we can drive the evolution to a clean, smart, national electricity system that will create jobs, reduce energy use, expand renewable energy production, and cut carbon pollution."

AEP Ohio recently announced the

purchase of 110 000 smart electricity meters from GE for its Gridsmart demonstration project, while ABB says it has established strategic partnerships with five advanced metering infrastructure (AMI) technology companies to demonstrate and test the integration of their devices with ABB's own technologies.

In New York state, meanwhile, Beacon Power Corporation has been granted a Certificate of Public Convenience and Necessity (CPCN) from the Public Service Commission to construct a 20 MW

flywheel energy storage plant in Stephentown. The facility will consist of 200 flywheel devices that will store excess energy from New York's grid, and transmit it back when needed. "This is an important decision for Beacon Power and for electricity users in the state," said Bill Capp, Beacon president and CEO. "We believe that [the] decision to approve the... Stephentown plant is recognition of the benefits that flywheel energy storage can bring in improving grid reliability and providing an essential grid service in a clean, low-cost way."

## Westinghouse must change AP1000 design

- Further diversification needed
- International firms seek investment

Plans to deploy Westinghouse Electric's advanced AP1000 nuclear reactor in the US could be delayed after the country's Nuclear Regulatory Commission (NRC) identified safety issues with the reactor's design.

The NRC is currently reviewing the AP1000 design and says that the shield building might not be able to protect the reactor from "severe weather and other events". It has requested modifications to the design as well as

tests to show that the new version will meet requirements.

The AP1000 is one of three next-generation reactor designs being reviewed by the NRC. At least seven energy companies in the USA have selected the reactor design for proposed nuclear power plants.

The impact of the required changes on the certification review schedule is not yet clear and will be determined after discussions between Westinghouse

and the NRC on how the company plans to address the issue. Westinghouse has already started reviewing what changes might be needed, and told the *Associated Press* news agency that it still expects the first of the proposed AP1000 plants to begin operating in 2016.

The shield building is a cylindrical structure that surrounds the reactor's concrete containment dome. It protects the main nuclear components of the

plant and is also critical to the AP1000's passive emergency cooling system.

The NRC has so far received a total of 18 applications for 28 proposed new nuclear power units in the USA. In September, US Senator Lamar Alexander (R-Tenn) called for the construction of 100 nuclear power plants in the next 20 years in order to benefit from "cheap, clean" energy.

The USA's 104 nuclear reactors supply 19 per cent of its electricity.

## Chile wins IEA praise

- Further diversification needed
- International firms seek investment

Chile has been recognised by the International Energy Agency (IEA) for its "remarkable strides" in energy policy and for the implementation of emergency measures during its 2007-8 energy crisis.

The South American nation is continuing to attract international investment in the energy sector, mainly as a result of its continued economic growth and an active energy sector development programme.

The IEA has praised Chile for developing energy efficiency as an underlying pillar of its energy policy

and for the efforts it has made to diversify its energy supplies. The planned opening of an LNG terminal in Mejillones in 2010 will significantly enhance supply diversity, says the IEA.

"Chile should continue diversifying its energy sources and suppliers to enhance energy security, and actively develop both energy efficiency and its indigenous energy resources such as renewables," said IEA Executive Director, Nobuo Tanaka.

French firm GDF Suez announced in October that it has won a bid worth \$3 billion to supply 2000 GWh/year

of electric power to Chilean power company EMEL and its subsidiaries. It has also inaugurated Chile's largest wind farm – the 38 MW Monte Redondo facility – located 325 km north of Santiago in Chile's central (SIC) region.

GDF Suez owns a 50 per cent stake in the Mejillones regasification terminal and is also constructing two thermal power plants in Chile.

Australian firm Hot Rock Limited is also hoping to help Chile diversify its energy sources through the development of the country's

considerable geothermal potential. The company says it is waiting for Chile's Ministry of Mines to make decisions on the company's eight uncontested exploration applications and four competitive tender bid applications.

Chile has no geothermal capacity but its geothermal potential is estimated to be as high as 16 000 MW. The IEA says that the country should accelerate its current renewable energy programme by implementing market-based mechanisms such as production tax credits or tradable green certificates.

## Argentina, AECL extend agreement

Argentina and Canada are continuing their cooperation in the nuclear energy field with a new agreement between AECL and Nucleoelectrica Argentina SA (NASA) and Comisin Nacional de Energia Atomica (CNEA).

Argentina has two operational nuclear reactors and is planning to further develop its nuclear energy sector through plant life extensions and the completion of a third, unfinished reactor.

The agreement with AECL includes a feasibility study to build a new CANDU reactor in Argentina as well as a number of other nuclear projects on which the three companies will collaborate. The agreement is for a period of three years and is an extension of an earlier agreement signed in 2006.

"This is a very positive development for AECL and Canada's nuclear industry," said AECL's President and Chief Executive Officer Hugh MacDiarmid. "By enhancing nuclear co-operation between Canada and Argentina we are creating significant commercial opportunities for both countries, and enhancing the efficiency and competitiveness of CANDU technology at a time when the international market for nuclear is growing rapidly."

The three companies are aiming to develop a programme for extending the life of the Embalse CANDU 6 reactor by 25 years, a project that would cost around \$400 million, according to the World Nuclear Association.

Argentina is also hoping to extend the life of the Atucha 1 reactor and complete construction of Atucha 2, work on which stopped in 1994 when it was 81 per cent complete.



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# Asian economies step up nuclear plans

A number of countries in Asia are looking to step up their plans for increasing nuclear power generation.

International Energy Agency Executive Director Nobuo Tanaka recently said that if Japan is to cut greenhouse gas emissions by 25 per cent from 1990 levels by 2020 as targeted by the government, it would have to build one nuclear power plant every year.

Japan would also have to raise the average capacity utilization of its nuclear plants to 90 per cent from the present level of around 70 per cent to achieve the goal.

"Japan has little room to depend on energy conservation to cut greenhouse gas emissions compared with other countries," Tanaka said, emphasizing the need for the country to utilize

nuclear energy to reduce emissions.

The growing importance of nuclear is also being recognised by other countries that are not yet on the nuclear map.

In September Vietnam, which forged ties with Japan back in 1997 to cooperate in nuclear power, said it would expand a national plan to build nuclear power plants over the next 20 years. Prime Minister Nguyen Tan Dung approved a goal to generate 15-20 per cent of the country's total power output from nuclear power by 2050.

Even in Australia there has been a significant shift in public opinion to nuclear. A recent survey, conducted by the *Melbourne Age* newspaper and the Nielson polling company, shows a marked change in Australian attitudes in the last three years. In 2006, only a

third of respondents thought the nuclear option was a good one. Today almost 50 per cent believe it would be a sensible alternative source of energy in a country that is heavily dependent on fossil fuels.

Asia is presenting big opportunities for investment in nuclear power. India will see a large increase in nuclear power generation in the coming years.

Indian Prime Minister Manmohan Singh said recently that the country could see a 100-fold increase in nuclear energy generation, in the next four decades.

Addressing an international conference on Peaceful Uses of Atomic Energy in New Delhi in October, Mr. Singh said: "If we can manage our programme well, our three-stage strategy could yield potentially 470



Nguyen Tan Dung: planning Vietnam nuclear

000 MW of power by the year 2050."

Many companies from countries like the US and France have been eyeing the opportunity to build nuclear power plants in India since an international ban on civil nuclear trade with the country was lifted last year.

The conference in New Delhi also focused on the issue of nuclear disarmament. Prime Minister Singh criticized the existing Nuclear Non-Proliferation Treaty, saying it has failed to prevent the spread of nuclear weapons.

His comments come in the wake of a UN Security Council resolution calling on all countries to sign the treaty. The resolution, passed at the beginning of October, has raised concerns that India will come under pressure to join the treaty, to which it is not a signatory.

## Global giants target Bangladesh

The world's leading power plant manufacturers and suppliers are queuing up to install 10 public sector peaking power plants in Bangladesh in response to a government call for electricity generation from oil.

As of October 7, as many as 40 overseas manufacturers, suppliers and their local agents had purchased tender documents for installing the liquid fuel-based power plants, which will have a total capacity of 830 MW.

Foreign prospective bidders including Siemens, Wärtsilä, the UK's EPSC, Sumitomo Corp., Daihatsu, and Malaysia's Kyb Umw Sdn Bhd, are keen to install the plants, said a senior Bangladesh Power Development Board (PDB) official.

According to a PDB source, the government plans to set up a total of 18 small power plants in different parts of the country by 2011 to add 1350 MW to the national grid. Private companies will set up the eight other plants on a rental basis.

The Bangladesh government has also decided to set up three larger private power plants on a build-own-operate (BOO) basis through a changed tendering process. Private developers will install the plants having a total capacity of 1125 MW at three locations – Bibiyana, Meghnaghat and Bhola district.

The country's overall electricity generation is now hovering at around 3800 MW against a peak demand of over 5500 MW.

At the end of September, the government formed a committee to mobilize funds of as much as \$10 billion as part of the country's desperate efforts in energy exploration and power generation.

## Thailand to tap carbon funds

Thailand's Carbon Fund is expected to be operational by the first quarter of 2010, structured as a high net worth trust as recommended by the Securities and Exchange Commission (SEC). The SEC is in the process of imposing regulations to facilitate establishing the Carbon Fund.

Similar to a mutual fund, the high net worth trust will mainly raise funds from institutional or high profile investors interested in the carbon business. To date, several foreign investors from Japan, including the Japan Bank for International Cooperation, and Europe have expressed keen interest in taking part in Thailand's Carbon Fund.

The Thailand Greenhouse Gas Management Organisation is hopeful the Carbon Fund could be set up this year so that Thailand can cash in on the expected greater CDM opportunities after December's climate change talk.

Separately, the World Bank said Thailand may apply for funding from the \$6.2 billion Climate Investment Funds (CIFs), which help developing countries move toward becoming lower-carbon economies. Thailand will likely decide late next month whether to apply to the fund.

Donor countries have pledged more than \$6.2 billion to the CIFs, which were set up last year and are managed and implemented by the World Bank together with the various development banks.

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## Asia News

## Indonesia power grid could start in 2011

State power company PT PLN plans to invest \$2.2 billion for a 700 km power grid linking Sumatra to Java in a project that could kick off in 2011.

PLN's planning and technology director Bambang Praptono said the grid will include 40 km of underwater power cables passing through the Sunda Strait.

"The grid will be used to transmit power from Sumatra to Java so that, in future, we won't need to build big power plants in Java," he said.

The cables will transmit power from six coal-fired plants in South Sumatra, to PLN's transmission network in West Java.

Bambang said the six power plants would have a capacity of 3600 MW of power. Up to 3000 MW will be transmitted to Java through the grid, with the remaining 600 MW to be supplied to PLN's Sumatra system, he added.

PLN plans to open a tender for the project in mid-2010, and expects construction to begin in 2011, with completion in 2016.

Eighty per cent of the required investment will come in the form of a loan from the Japan International Cooperation Agency (JICA), and the remaining 20 per cent will be financed by PLN.

PLN maintains a monopoly on electricity distribution in the country, but a recently passed electricity law stipulates private companies, previously limited to power generation, will be allowed to enter the distribution business.

Nationally, only 65 per cent of the country's territory is connected to PLN's grid, most of it in the more developed western islands. Only 45 per cent of eastern Indonesia is connected to the grid.

## Philippines eyes gas fired projects

The Department of Energy (DOE) expects an additional 3600 MW of new natural gas fired capacity will be built in the country in the next six years as part of an estimated \$5 billion in fresh investment in the downstream natural gas sector.

In his presentation during last month's Philippine Economic Briefing, Energy Secretary Angelo Reyes said these power plants are among the investment opportunities that could be explored by investors who want to engage in natural gas development.

"Our policy to diversify energy sources creates potential for investments, which include putting up critical infrastructure to bring energy to various end-users. Among our top priority is the proposed gas transmission network in Luzon to bring the gas from Malampaya to different economic zones and transport sectors in the area," Reyes said.

He said the bulk of the additional power output, around 3000 MW, would be "greenfield" projects and the remaining 600 MW would be existing power plants which will be up for conversion.

At present, the country has three natural gas-fired power plants: the 1200 MW Ilijan (1200 MW); Santa Rita (1000 MW) and San Lorenzo (500 MW). These plants are part of the \$4.5-billion Malampaya gas-to-power project.

# India amends power policy to boost projects

In a major policy shift, the Indian government has allowed states, which have not carried out reforms in power distribution, to buy electricity from projects of 1000 MW or above in size, said government officials.

Previously, these states were not allowed to buy power from so-called 'mega projects' (larger than 1000 MW). The Cabinet approved the change in the Mega Power Policy but said that these states would have to carry out reforms in the power distribution business.

"The existing condition of

privatization of distribution by power purchasing states would be replaced by the condition that power purchasing states shall undertake distribution reforms as laid down by the Ministry of Power," sources said after the Cabinet meeting chaired by Prime Minister Manmohan Singh.

It is believed that the distribution reforms would include compulsory metering of all power supplied and a cut in transmission and distribution losses, commonly referred to in India as "power theft".

Some states like Delhi have

Manmohan Singh:  
India Prime Minister



privatized power distribution, as have a few cities such as Mumbai, Ahmedabad, Surat, Noida and Kolkata. In the rest of the country, distribution is controlled by State Electricity Board and state government undertakings.

The Cabinet also decided to remove the condition that required inter-state sale of power as a prerequisite of mega power status. Previously, only projects that had inter-state power sale agreements were granted mega power status.

The government extended the

benefits of mega power policy to the supercritical power projects to be awarded through the 'International Competitive Bidding' (ICB) route with the mandatory condition of setting up an indigenous manufacturing facility.

In another change in the policy, the government will now allow developers to procure equipment for mega power projects without inviting bids through the ICB route, with a proviso that either the project has been awarded, or a requisite volume of power has been contracted through tariff based competitive bidding.

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# Market reform needed for climate change targets

Utilities in the UK's liberalised power market have little incentive to make the required investments in low carbon generation, writes Siân Crampsie.



Kingsnorth: delayed due to falling power demand

The UK's liberalised electricity market structure must be reviewed if the country is to meet targets for cutting carbon emissions, according to a government committee.

The UK has one of the most liberalised electricity markets in the world as well as the most ambitious targets for carbon emissions, but the government's Committee on Climate Change says that utilities have little or no incentive to invest in low carbon technologies.

It says that a "step change" in the pace of emissions reduction is required and that the current recession – which has witnessed significant falls in energy demand across the world – could give governments a false sense of security over carbon emissions.

The Committee was set up by the government to establish and monitor progress against the UK's carbon

budgets, which set out a pathway for an 80 per cent reduction in carbon emissions over 1990 levels by 2050.

Ofgem, the UK's energy regulator, says that £200 billion of investment is needed in the UK to replace ageing infrastructure and cut emissions. The Climate Change Committee believes that unless the market is reformed, or new measures are brought in, investments in low carbon technology will not be made.

The report from the Committee came as E.On UK announced that it would postpone the development of its advanced coal-fired Kingsnorth power plant in Kent, southeast England due to a drop in demand. Similarly Denmark's Dong Energy has pulled out of a partnership with Peel Energy to build an advanced coal fired power plant in Scotland.

Both plants had been entered into the

UK government's competition to win funding for the commercial demonstration of carbon capture and storage (CCS) technology. Although E.On says that it has not formally withdrawn from the competition, it is clear that Kingsnorth would not make the 2014 deadline for commercial operation stipulated in the competition.

A key part of the problem is the apparent failure of the European Union's Emissions Trading Scheme (ETS), under which carbon prices currently stand at around €13/tonne. The low price is partly the result of the recession but the UK's Climate Change Committee has forecast that it will only be about €20/tonne in 2020.

At these carbon price levels, utilities are likely to favour gas-fired generation over renewables and other low carbon technologies. A carbon price of around €50/tonne is required for investments

to be made in CCS technology.

A renewed 'dash for gas' scenario would harm the UK's energy security, says the Committee, which also recommends that the government redouble its energy efficiency efforts.

E.On has launched a preliminary application for a new gas fired power plant of the same size as Kingsnorth, in Nottinghamshire

The Committee says that the UK government should investigate ways of strengthening the carbon price, provide more certainty on the price paid for low carbon generation, and ensure investment in low carbon technologies through a low carbon obligation or similar.

Investment in low carbon generation will come at a price for consumers, however, with Ofgem predicting a surge of up to 60 per cent in domestic energy bills by 2016.

## Italy signs nuclear deal

- Key deal for Italian nuclear revival
- Belgium postpones nuclear phase out

Italy has paved the way for US suppliers to take part in its nuclear revival by signing a nuclear cooperation agreement with the US government.

The two countries inked the five-year agreement in Washington, D.C. during a visit by Italian industry minister Claudio Scajola. The deal will allow American companies to supply goods and services for nuclear energy projects in Italy, which is planning the construction of several new nuclear power plants.

The agreement was signed as Belgium's government said it would postpone the country's planned phaseout of nuclear power by 10 years as part of a plan to restore government finances.

The agreement, which was

welcomed by both Westinghouse Electric and GE Hitachi, calls for the two countries to cooperate in the construction of up to 12 new nuclear plants in Italy, as well as exchange skilled nuclear workers, information and materials.

"We are excited about the prospect of supporting the development of a domestic nuclear energy programme in Italy," said Jack Fuller, CEO of GE Hitachi.

Italy's nuclear power programme is aimed at boosting energy security, reducing power prices and lowering carbon emissions. It was launched earlier this year after a two-decade moratorium on nuclear energy.

"We at Westinghouse look forward to this emerging opportunity," said Westinghouse President and Chief

Executive Officer Dr. Aris Candris. "Italy clearly wants and deserves access to the world's best technology as it works to make clean, safe and reliable nuclear energy a larger part of its energy mix."

The turnaround in nuclear energy policy in Italy and Belgium is a sign that governments have realised the benefits of nuclear energy in a carbon-constrained economy.

Belgium says that it will allow Electrabel to extend the life of three of the country's seven nuclear reactors for 10 years beyond 2015 in exchange for an annual levy of around €15-245 million, payable for five years. The utility, which is owned by French group GDF Suez, could also face a €500 million windfall tax to help finance renewable energy and energy

efficiency programmes.

Belgium agreed six years ago to shut all of its operational nuclear reactors down between 2015 and 2025.

Italy has also signed nuclear cooperation agreements with Russia, France and Japan. French utility EDF and Italy's Enel have already established a joint venture to build up to four EPR reactors in Italy.

Italy passed legislation allowing the construction of new nuclear plants in July 2009. It has set a target of generating 25 per cent of electricity from nuclear by 2030, and the government is currently working on identifying sites.

Electricity prices in Italy are among the highest in Europe, largely because of the country's high dependence on energy imports.



Claudio Scajola: inked US deal

## PGE and Yello Strom launch smart grid initiatives

- New projects trialling smart meters
- Commission calls for €80 billion clean energy investment

The European Commission's drive to enhance energy efficiency throughout the 27-nation bloc is driving technology firms and governments to launch "smart city" projects.

Poland and Germany are the latest countries to witness the launch of smart grid initiatives, following in the footsteps of Malaga in Spain, Salerno in Italy and Amsterdam in the Netherlands, among others.

In Poland, utility PGE and PCN Technology have teamed up to develop a smart grid initiative in Warsaw, while in Germany, EnBW subsidiary Yello Strom has announced a smart grid pilot project with Cisco.

Smart grid technologies such as advanced meters and other energy management tools have been shown to reduce energy consumption by as much as 10 per cent, according to Cisco.

The smart grid initiatives were announced as the European Commission called for an additional €50 billion of investment in low carbon energy technologies over the next 10 years to enable the EU to meet its climate change and energy security goals. The Commission has bundled a new "smart city" programme into its Strategic Energy Technology (SET) Plan and says that the conditions for the mass market take-up of energy efficient technologies must be created.

PGE and PCN Technology's project will result in the roll-out of around 800 000 smart meters in and around Warsaw. In Germany, Cisco and Yello Strom have collaborated to enable 70 selected homes and businesses to communicate intelligently with the local power grid and power sources over an Internet Protocol (IP) network.

Customers will use Yello Sparzaehler online – a smart electricity meter – to receive information about their electricity consumption in real-time. Meanwhile, a home energy management system will allow customers to set appliances such as washing machines to operate during off-peak periods, via the use of 'smart plugs'.

The European Commission has made smart grid technologies a key "technology pillar" of its SET Plan, alongside renewables, carbon capture and storage, electricity grids, bioenergy and nuclear fission. It wants banks, energy companies and governments to find an extra €5 billion per year for the next 10 years to reach the SET Plan goals.

It estimates current clean energy investment levels in the EU to be €3 billion per year.

The Commission's Smart City programme envisages the creation of 25-30 smart cities around Europe and will require €11 billion of investment.



# Eskom seeks 45 per cent annual tariff hike

Even if proposed tariff increases get the go-ahead in South Africa, Eskom could still be left with a shortfall in funding for its expansion programme, writes Siân Crampsie.

Eskom says that it will be able to serve as the "oxygen" of the South African economy if the country's energy regulator approves significant tariff increases for the next three years.

The government-owned South African utility has submitted an application to regulator Nersa, proposing average electricity price increases of 45 per cent per annum for the three years starting April 2010. It says that the tariff hikes are needed to make it more technically and financially viable and sustainable.

It expects to hear Nersa's decision on its proposal in February 2010 after a period of public consultation.

But Eskom says that even if the increases are approved, it will still be left with a cash shortfall.

Electricity tariffs in South Africa average 33c/kWh, a level that Eskom says does not allow for the recovery of costs, the maintenance of assets or its capital expansion programme. A more appropriate tariff level would be 80-88c/kWh, says the utility.

If approved, the price increases would

take effect in 2010 and follow an average 31.3 per cent tariff increase approved and implemented in mid-2009. The proposed price increases would result in tariffs reaching an average 99c/kWh in 2012.

There has been concern in South Africa over the effect of large tariff hikes on the poor as well as on inflation. Nersa recently said that electricity prices might have to rise by up to 60 per cent per annum in order to meet Eskom's financial needs.

Eskom is currently in the midst of a five-year capital expansion programme aimed at boosting generation, transmission and distribution capacity. It is building several major new power stations and has also embarked on an independent power producer (IPP) programme to boost capacity.

In early 2008 the country suffered massive electricity shortages, which were the result of rapid economic growth, a lack of investment in generation capacity and logistical problems with primary fuel supplies.

Eskom says that in analysing its needs, it considered proposing a massive 146 per cent increase in the first year, followed by smaller increases in the two subsequent years. While this would be the best option for the utility's finances, the impact on consumers and the economy would have been too severe.

The utility has therefore agreed with the government to propose a system of "smoothed" tariff increases, even though this will result in cash shortfalls ranging from R2.1 billion (\$273.8 million) to over R30 billion in each of the three years.

Eskom says it will look into other funding interventions to address the expected shortfall, including the issue of additional guarantees by the government, and debt. It notes that the level of tariff increase approved by Nersa will be critical to its ability to borrow, and therefore to its ability to implement the capital expansion programme.

The utility also says that if it cannot

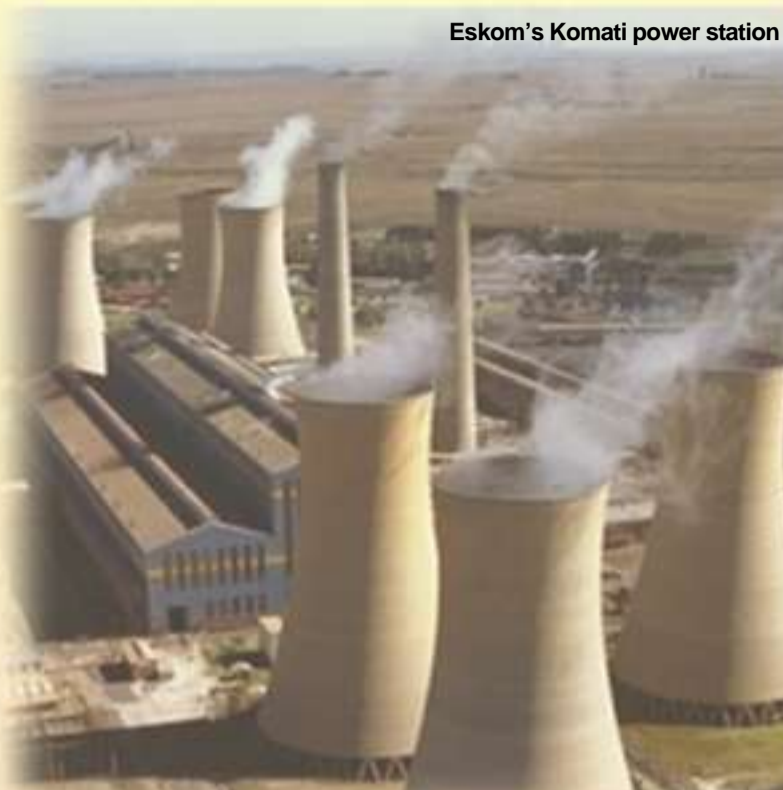
finance the expected shortfall, it will be forced to re-phase the capital expansion programme to align it with the available funding.

To mitigate the impact of the tariff increases on the poor, Eskom has proposed an increase in the free basic electricity allowance and that the incremental costs be funded through a cross-subsidy.

Eskom has so far solicited funding from the South African government, the African Development Bank and the European Investment Bank. Its credit rating was downgraded in 2008 – largely as a result of low tariff levels and the company's heavy reliance on the government.

Eskom's application also notes the uncertainty surrounding possible climate change obligations in South Africa and the effects of this on its costs.

South Africa is currently developing a national climate change strategy, and in September launched the South African Centre for Carbon Capture and Storage.



Eskom's Komati power station

## Nigeria provides \$4.6 billion boost

Nigeria has seen little improvement in its power supply situation in spite of a number of initiatives implemented by its federal government.

In an effort to achieve its target of 6000 MW of installed capacity in the country by December, the government has disbursed \$4.6 billion for the financing of a number of key projects, including the Niger Delta power projects, National Integrated Power Projects (NIPP) and Mambila power projects.

Blackouts remain a major problem in the country, according to local press reports. A lack of investment coupled with corruption and problems with natural gas supplies have all contributed to the state of the power sector.

The NIPP had been abandoned but an agreement between the state and federal governments over refinancing has allowed it to be revived. It would see the construction of 10 new power plants across the country.

Installed capacity in Nigeria is already at around 6000 MW, but available capacity is estimated to be closer to 2500 MW.

Other initiatives undertaken by the government over the last 12 months include a renewable energy initiative, a preliminary agreement with Germany for the construction of new generating capacity and the diversion of natural gas supplies to the domestic market.

## Jordan ready for new IPP

Construction of the second independent power producer (IPP) project in Jordan is set to start after the country's government signed a number of project agreements with an international consortium.

The Qatraneh Electric Company, which comprises Korea Electric Power Company (Kepco) and Zenel Company of Saudi Arabia, is to build a 373 MW natural gas-fired combined cycle power plant in the Kingdom at a cost of \$455 million.

Jordan is facing a rapid rise in electricity demand due to economic development and urban expansion. The Ministry of Energy and Mineral Resources says that installed capacity in the country should reach 4000 MW.

The Qatraneh consortium has signed a land leasing agreement with the Ministry of Finance, an executive agreement with the Ministry of Energy and Mineral Resources and a water provision agreement with the Water Authority. It will develop the project on a build-own-operate basis under a 25-year contract.

The first simple cycle phase of the project will go into operation at the end of November 2010 while the second combined cycle phase will become operative in August 2011.

Jordan's current installed capacity stands at around 2500 MW. Natural gas accounts for 79 per cent of generation.

The 380 MW Amman East power plant was Jordan's first IPP and started operation in 2008.

# Baltic nuclear plant set for construction

- Equity likely for international firms
- Plant will compete with Lithuanian plans

The construction of a new nuclear power plant in the Russian territory of Kaliningrad is set to go ahead after the country's government formally approved the project.

Russian Prime Minister Vladimir

Putin issued a decree for the project, which will be built by Atomstroyexport with the assistance of foreign investors. The plant will be situated close to the Lithuanian border.

Preliminary construction work is

expected to start in early 2010.

The Baltic nuclear power plant will comprise two 1200 MW VVER units and Russia could offer as much as 49 per cent equity in the project to foreign investors. Czech utility CEZ and Iberdrola of Spain have expressed an interest in the project, according to the World Nuclear Association, which also says that the project could be a proving

ground for Siemens' proposed collaboration with Rosatom.

Russia's plans are that the new plant will generate electricity for export. This means that the Baltic plant would directly compete with Lithuania's plans for a new nuclear reactor.

The Baltic plant's first unit is scheduled to be on-line in 2016, and the second in 2018.

# Brazil to finance Ghana dam

Work on a hydropower plant in Ghana that has been on the drawing board since 1992 could start in 2010 after the Brazilian government agreed to help finance

the project.

The project, on the River Oti at Juallay in eastern Ghana, will add 90 MW to the country's installed capacity of 2000 MW and is part

of government plans to reach 3000 MW of installed capacity.

The dam will be constructed at a cost of \$300 million, \$250 million of which will be provided by the

Brazilian government. Brazilian firms Constructura Noberto Odebrecht and Andrade Gutierrez will be the main contractors for the project.



# Siemens gives ultimatum to former CEOs

Klaus Kleinfeld

Heinrich von Pierer

Siemens is hoping to tie-up the loose ends from its corruption scandal once and for all by mid-November, writes Siân Crampsie.

Germany's Siemens is aiming to bring an end to the chapter in its recent history that was clouded by a corruption and bribery scandal by forcing former management board members to pay damages.

The engineering firm has issued an ultimatum to the seven executives, including former Chief Executives Klaus Kleinfeld and Heinrich von Pierer, asking them to reach a settlement with the company by mid-November.

It says that the individuals will face legal action if settlements are not reached by the deadline.

Siemens is seeking damages from the executives, which also include Johannes Feldmayer, Thomas Ganswindt, Heinz-Joachim Neubürger, Jürgen Radomski and Uriel Sharef, claiming that they breached their supervisory responsibilities by allowing some €1.3 billion worth of bribes to

be given. Three other former Siemens executives have already reached a settlement with Siemens, which has paid out €2 billion in legal fees and fines over the corruption affair.

The company is seeking €6 million from von Pierer and €2 million from Kleinfeld, who is currently CEO of Alcoa.

Siemens reached settlements with the US and German authorities over the corruption in late 2008, agreeing to pay penalties totalling around €1 billion. The company was found to have made payments to officials around the world in order to win contracts.

Siemens says that it has made major efforts since 2007 to develop a new and effective compliance system with a strong focus on sensitizing employees to anti-trust issues. Its 215 000 employees have all completed compliance-related training courses.

Siemens recently avoided a €33.4

million fine from the European Commission for blowing the whistle on a power transformer cartel operating in the European Union and Japan.

In October the European Commission imposed fines totalling €67.6 million on seven companies – including Siemens – for operating a power transformer cartel in the European Union between 1999 and 2003. The cartel was labelled a “rip-off” by Competition Commissioner Neelie Kroes, who spared Siemens its fine for cooperating with authorities and bringing the existence of the cartel to light.

Other members of the cartel included ABB, Areva T&D, Alstom, Fuji Electric, Hitachi and Toshiba. The European Commission's investigation found that the companies operated an oral market sharing agreement, or “gentlemen's agreement”, where the Japanese firms agreed not to sell power

transformers into Europe and vice versa.

The Commission increased ABB's fine by 50 per cent because of the company's participation in another cartel.

“Customers and tax payers all over Europe suffered from this cartel for a number of years. The Commission has now put an end to this rip-off by the self-appointed ‘Gentlemen’,” said Kroes. “The Commission will not hesitate to increase fines for repeat offenders until they have learned the lesson that cartels do not pay.”

The Commission's investigation started with surprise inspections on the companies' offices in February 2007. At the time of the infringement, the parties' combined annual sales in the European Economic Area (EEA) were estimated to be worth around €100 million, according to the European Commission.

## Proglorio to be new EDF head

Veolia Environnement chief Henri Proglorio could forge closer ties between Veolia and EDF when he takes the helm of the state-owned energy group.

Proglorio has been named by the government as the successor of Pierre Gadonnix, EDF's current CEO, who is due to step down in this month. While his appointment has yet to be made official, he is likely to retain a role at Veolia, possibly as a non-executive chairman.

The two companies already have a joint venture energy services company and analysts believe that Proglorio is keen to replicate the merger that took place between GDF and Suez.

In taking over EDF, Proglorio will be overseeing EDF's nuclear fleet in France as well as the firm's recent major overseas acquisitions.

He will also be taking on the troubled EPR project at Flamanville, France, and will be responsible for implementing the French government's proposed changes to the French electricity market that are designed to improve competition.

Gadonnix is leaving EDF after five years in charge.

## E.On nears 5 GW divestment mark

E.On has made further in-roads to its commitment to the European Commission to divest generating assets with the conclusion of a number of key deals with rival utilities.

The European Commission has approved a proposed asset swap deal between E.On and Belgium's Electrabel, while the German energy company has also reached an agreement with France's EDF and German rival EnBW to swap generating capacity.

E.On has also agreed to sell its 50 per cent stake in the Mehrum power station in Germany to Stadtwerke Hannover.

In all, E.On says that it has now signed agreements for the sale of approximately 4800 MW of capacity,

just short of the 5000 MW it promised the European Commission it would divest in order help improve the competitive landscape in Europe's electricity market.

It is also in the process of selling its high voltage electricity network in Germany in order to comply with new European rules on energy company unbundling.

E.On says that its deal with EDF and EnBW will strengthen its position as the third largest energy company in the French market. Under the deal, E.On is to acquire a 35 per cent stake in French energy supplier SNET from EDF and Charbonnage de France, as well as rights to 800 MW of nuclear output in France.

In return, it is giving up 1215 MW of nuclear and coal-fired capacity in



Langerlo coal fired power plant

## Total boosts solar PV R&D

Total says it has reaffirmed its commitment to clean energy research and development through the support of two solar energy organizations.

The French oil firm has joined forces with Laboratoire de Physique des Interfaces et des Couches Minces (LPICM) to create the NanoPV joint research team, while its subsidiary Photovoltech has joined the IMEC industrial affiliation programme (IIAP) on next generations of crystalline silicon solar cells.

LPICM is a joint R&D research team between the French National Center for Scientific Research and Ecole Polytechnique engineering school and the organizations' new NanoPV team will focus on research into thin film technologies for photovoltaic solar applications.

The NanoPV team will consist of 15 researchers and PhD students, with Total providing around €8 million of funding during the first four years. The research programme will develop silicon thin film technologies and explore new concepts using silicon nanowires.

The IIAP programme concentrates on reducing the cost of solar energy by reducing silicon use and increasing solar cell efficiency. Photovoltech is a joint venture between Total and GDF Suez.

“This agreement shows the importance of our research for the global energy market,” said Luc Van den Hove, President and CEO at IMEC. “By 2025 at least 20 per cent [of] worldwide energy supply will come from renewables. Solar energy will ensure at least 10 per cent of the total electricity supply, but to achieve this, we need to join forces to strongly reduce the cost of solar technology.”

Philippe Boisseau, President of Gas and Power at Total said: “This agreement with IMEC, a world-class research centre and historic partner of our branch Photovoltech, will give us access to promising new technologies for silicon solar cells. It will strengthen our skills and our scientific and technical commitment in new energies.”

## Areva T&D sell-off enters second phase

Areva is continuing talks with three companies in a bid to secure a buyer for its transmission and distribution (T&D) unit.

The French engineering firm confirmed at the end of September that it had selected three potential bidders to take part in the second phase of the sale process for its T&D arm, which is being divested as part of an €1 billion financing plan.

USA-based GE has confirmed that it is one of the potential buyers and is bidding in consortium with private equity firm CVC Capital Partners. A consortium of Schneider Electric and Alstom is also bidding, as is Japan's Toshiba Corp.

Areva says it will be “paying particular attention not only to the price proposed, but also to the industrial and labour projects” proposed by the bidders. A decision is expected in mid-November, according to reports.

## Tenders, Bids & Contracts

### Americas

#### Wärtsilä wins five-year contract

A Brazilian consortium has awarded Finnish firm Wärtsilä a contract to operate and maintain two power plants in Miranda do Norte, northeast Brazil.

Geranorte, which is made up of holding company Equatorial Energia, the Brasil Energia Investment Fund and GNP SA, says that the five-year contract is for the Geramar I and Geramar II power plants. The two plants are scheduled to come on-line in January 2010 and will have a combined capacity of 320 MW.

Wärtsilä supplied the two plants with nineteen 20V32 engines under a previous contract. The latest contract brings the total number of plants operated and maintained by Wärtsilä in Brazil to 12 with a total capacity of 1 GW.

#### Vogt chosen for Moselle repowering

South Mississippi Electric Power Association (SMEPA) has selected Vogt Power International Inc. to supply two heat recovery steam generators (HRSGs) for the Moselle repowering project in Jones County, Mississippi.

Vogt, a subsidiary of Babcock Power Inc., will design, manufacture and deliver two natural gas fired, two-pressure natural circulation HRSGs as well as an SCR (selective catalytic reduction) system to remove nitrogen oxide (NOx) from the gas turbine exhaust stream. The repowering project will add 134 MW of generation capacity to the plant, and is scheduled for completion in 2012.

GE is supplying 7EA gas turbines for the project.

#### TransCanada wins BOO contract for Ontario plant

TransCanada Corp. has won a contract to build a natural gas fired power plant in Oakville, Ontario, a move that the firm says will strengthen its presence in the Ontario and Canadian power markets.

TransCanada is expecting to invest C\$1.2 billion in the 900 MW plant, which is scheduled to start operating by the end of 2013. The 20-year contract to build, own and operate the Oakville facility was awarded by the Ontario Power Authority.

"We look forward to providing additional electricity supply and reliability within this key North American market," said Hal Kvisle, TransCanada's chief executive officer. "The Oakville generating station is a strong fit with our strategy of developing large scale energy infrastructure projects that will produce stable, long-term returns for our shareholders."

Ontario is seeking new sources of clean power such as hydro, wind and gas-fired generation to offset the impact of the province's plans to close coal-fired plants.

### Asia Pacific

#### Gujarat approves Canasia project

Canadian power development firm Canasia says that the government of Gujarat, India, has approved plans to increase the size of a proposed power project.

Canasia was planning to build a 1320 MW supercritical coal fired power plant in Gujarat state, but recently submitted a proposal to increase the size of the project to 1980 MW by adding a third 660 MW unit.

The company has praised the

efficiency of the Gujarat government and says that it has decided to broaden its scope of activities in the state to include solar power, natural gas and possibly geothermal.

#### Vestas wins India order

Vestas Wind Systems has received an order for 60 wind turbine units for a wind power project in Theni in India's Tamil Nadu state.

The Danish firm will equip the project with its V82-1.65MW wind turbine. The order was placed by Hong Kong-based power utility CLP, and includes the supply and commissioning of the turbines, a supervisory control and data acquisition system and a 10-year service and maintenance agreement.

#### North Delhi Power opts for outage management system

India's North Delhi Power Limited (NDPL) is to become the first utility in the country to install an advanced outage management system (OMS).

The distribution company, a joint venture between Tata Power and the government of Delhi, has placed an order with GE Energy for a PowerOn OMS to help it meet growing energy demand and improve the reliability of the grid.

According to GE, the PowerOn system, coupled with automatic meter infrastructure, will enable NDPL to identify local faults quickly and precisely. It will be integrated with an existing GE Energy geospatial information system as well as NDPL's existing distribution management system.

NDPL has implemented several distribution system enhancements over the last five years and has reduced losses from 54 per cent to 18 per cent as a result.

#### Ovation selected for Sri Lanka plant

Emerson Process Management has announced that its Ovation expert control system is to be installed at Unit 1 of the new Puttalam coal-fired power plant in Sri Lanka. The project marks Emerson's first Ovation installation in Sri Lanka.

The contract was awarded by the China National Machinery & Export Corporation, which is building the 300 MW unit. Ultimately, Puttalam will be a three-unit, 900 MW power plant, making it the largest power generating facility in Sri Lanka.

The Ovation control system, a key component of Emerson's PlantWeb digital plant architecture, will monitor and control the boiler and turbine, flue gas desulphurization system, and balance of plant processes for Unit 1. Emerson will also supply its AMS Suite predictive maintenance software, which will provide operators with data from HART intelligent field devices installed throughout the plant.

### Europe

#### GE provides Italy with wind turbines

GE Energy has announced that it is to supply Italy's Gruppo Energia & Servizi with 29 wind turbines for three onshore projects in southern Italy.

The US firm will supply its 2.5 MW units to the projects, which will add a total of 72.5 MW to the grid and help Gruppo Energia & Servizi to reach its target of doubling its current installed capacity.

Gruppo Energia & Servizi's wind farm in Racalmuto, Sicily, will receive 17 2.5x1 wind turbines, while two additional projects in Lacedonia and Ginestra degli Schiavoni, Campania, will each get six 2.5x1 wind turbines.

The Racalmuto wind farm is GE Energy's first project in Sicily.

All of the wind turbines will be operational by the end of 2010. GE will provide all of the equipment, transportation and installation of the turbines, as well as supervisory control and data acquisition and grid integration accessory features.

#### Statkraft targets Italy for solar

Norwegian state-owned utility Statkraft has signed an agreement with Solar Utility to develop eight solar photovoltaic (PV) plants in Italy.

Statkraft says that solar radiation levels in Italy as well as the country's renewable energy policies make it an attractive market for PV project development. It has acquired eight projects from Solar Utility and the two companies are now working on establishing an EPC contract for developing the projects.

The eight projects have a total capacity of 20 MW and are all located in the Puglia region. Statkraft says it is also looking at development opportunities in Spain and Southeast Europe in order to reach its goal of 75 MW solar power capacity by 2012.

#### AF Colenco awarded Swiss hydro contract

A Swiss consortium has awarded AF Colenco a €27 million contract for engineering services for a pumped storage hydropower plant in Nant de Drance, Switzerland.

The consortium, comprising Swiss utility Alpiq, Swiss federal railway SBB and regional power utility FMV, is developing the 600 MW plant in the Valais municipality of Finhaut. The AF contract includes general project management, detail engineering and site supervision services.

The plant is due to be commissioned in 2015.

#### Siemens and Airtricity sign contract

Airtricity has awarded Siemens a major contract to supply the wind turbines for a 350 MW onshore wind farm in southern Scotland.

Under the contract, Siemens will supply its 2.3 MW machines, which will be installed at the Clyde wind farm in South Lanarkshire, 70 km south of Glasgow. The project is due to be commissioned in 2012.

"Following our successful completion of the Scottish Whitelee wind farm earlier this summer – at 322 MW, Europe's largest wind farm to date – Clyde marks a new milestone for onshore wind power in Europe," said Andreas Nauen, CEO of the Siemens Wind Power Business Unit.

The scope of supply for Siemens includes the delivery, installation and commissioning of the wind turbines. Siemens will also assume responsibility for operation and maintenance for an initial period of five years.

#### RWE plans 50 MW biomass plant

RWE npower renewables has reached an agreement with papermaker Tullis Russell to supply its paper mill in Fife, Scotland, with heat and electricity from a new biomass-fuelled combined heat and power plant.

The new 50 MW plant will use around 400 000 tonnes/year of virgin and used wood from a range of sources, says RWE npower renewables, the UK subsidiary of RWE's renewable energy unit. It will replace an existing coal-fired power plant at the Tullis Russell site, and will reduce annual carbon dioxide

emissions by 250 000 tonnes.

RWE Innogy will invest around £200 million in the new plant, and has also secured an additional £8.1 million of support from the Scottish government.

### International

#### Ausra selected for Jordan CSP project

Ausra Inc has won the contract to supply the solar steam boiler for the proposed 100 MW JOAN1 concentrating solar thermal power (CSP) project in Jordan.

The JOAN1 project will be located in Ma'an, Jordan, and will be one of the largest CSP projects in the world using direct solar steam generation when it starts operating in 2013.

The order was placed by Germany-based MENA Cleantech AG, which said that Ausra's technology, experience and OEM business model made it the most suitable supplier for the project. Ausra plans to build an advanced manufacturing facility in Jordan in order to meet the project's requirements.

JOAN1 is scheduled for financial close in the fourth quarter of 2010, with construction beginning in early 2011.

#### Ener-G secures Lithuania landfill contract

Clean energy firm Ener-G has won a third contract in Lithuania to supply a landfill gas-fired power plant.

The company is already developing a 3 MW landfill gas generation project in Vilnius and another 1.5 MW project in Klaipeda. The latest contract is for a 1 MW facility in Alytaus in southern Lithuania.

The three projects will supply enough electricity to power 5500 homes and will require a total investment of £5 million, according to Ener-G. Construction of the Vilnius and Klaipeda projects will be completed in 2009, while work on the Alytaus project will start later in 2009.

#### Enlight to build 25 PV installations

Enlight Renewable Energy has won a build, operate, transfer (BOT) contract to build 25 solar photovoltaic installations in Israel.

Under the contract, Enlight will install photovoltaic systems on the roofs of large industrial farm buildings throughout the country. It will rent the roof space under 20-year rental contracts with the buildings' owners, and sell the electricity to Israel Electric Corporation (IEC) under a 20-year power purchase agreement.

Netanya-based Enlight will be the engineering, procurement and construction contractor for the projects and is aiming to reach financial close in late 2009.

#### SEC converts Qurayat to combined cycle

The Saudi Electricity Company (SEC) has awarded a contract for the conversion of the open cycle gas turbine power plant at Qurayat to combined cycle operation to a consortium made up of Arabian Bemco Contracting Co. Ltd. and Korea's Doosan Heavy Industries & Construction.

Under the SR6.9 billion (\$1.84 billion) contract, the consortium will add 15 heat recovery steam generators, five steam turbines and auxiliary equipment to the existing power plant to form a five-unit combined cycle power plant with an output of 3200 MW. The project is due for completion by June 2014.



# Still a role for coal in a carbon constrained world?

Some industry observers question whether there is a place in the future generating mix for supercritical coal plants, especially with the increasing amount of wind generation. One expert explains why he believes there is.

**Ram G. Narula**

With the increasing interest in renewables, especially wind, and the renaissance of nuclear power, some observers are questioning where large supercritical coal-fired power plants fit in the future energy picture.

The suggestion is that coal plants cannot follow load to complement wind; at the same time, they cannot compete with nuclear, which can remain on line reliably. The inferences here are (a) gas-fired generation (simple cycle or combined cycle) can meet the cycling needs made necessary by the variability of renewables; and (b) coal plants do not cycle and are not as reliable as nuclear.

To answer these questions, it is necessary to look at the four major generation technologies involved in the equation i.e. renewables, nuclear, gas and coal.

**Renewable energy:** In the coming decades, the world in general and developing countries in particular will be challenged to reduce carbon emissions to combat climate change. Governments around the globe have established or are setting up mandatory renewables portfolio standards for providing up to 30 per cent of electricity by 2025 and are introducing monetary incentives to promote rapid growth of modern renewable energy (wind, solar, marine, geothermal, etc.).

Unfortunately, renewable energy is more robust in remote locations away from population and load centres. Most of the US transmission and distribution grid infrastructure was built over 30 years ago, before the restructuring of wholesale markets and the dawn of modern renewable energy. So the current grid was not designed to support what is expected of it now, and it cannot be made "smart" overnight.

Unlike traditional fossil or nuclear energy, renewable energy is not available 'on-demand' due to its variability and the lack of an economic storage technology. The variability factor comes into play least with geothermal and most with wind. Some people claim that wind produces large ramp events over short periods of time. What would a utility do when one of its 1000 MW wind farms loses the bulk of its output within a short time on a hot summer afternoon? Its first option is to shut off power supply to its interruptible customers and quickly restore power within 60 or 90 minutes to meet its contractual obligations.

Undoubtedly, the best way to accomplish this is to fire up simple cycle gas turbines or 'quick start' combined cycle plants. Gas turbine suppliers have done an outstanding job of meeting this need by offering designs such as 100 in 10 (100 MW in 10 minutes) with a ramp rate of 10 per cent per minute that a coal plant cannot match. However, a nominal 1000 MW supercritical coal power plant, when operating or in hot standby, can also pick up an additional 100 MW in 10 minutes or less with a ramp rate of 1-2 per cent per minute.

The greater the percentage of electricity generated by renewables (especially wind) in a system, the greater the dilemma posed by the foregoing issues. The variability issue underscores the need for hybridizing the renewables. Some even argue that implementing renewables too rapidly could lead to increased risk to grid reliability, blackouts, or unnecessarily

high prices. The fact that wind and some other renewables do not help to meet peak demand means that dispatchable generation is needed during these periods. Therefore, renewables do not reduce the investment in dispatchable power but only reduce the need for fossil fuel plants. Renewables also have a low capacity factor and produce electricity only 30 per cent of the time. So renewables cannot possibly replace the need for base load/two-shift generation afforded by nuclear and coal-fired power.

Ironically, while the public supports renewables in principle, the not-in-my-backyard syndrome prevails and there is formidable opposition to siting the transmission lines that are critical to expand the use of renewable energy.

**Nuclear:** Over the past two decades, the US nuclear industry has done an outstanding job in significantly improving the safety and performance of the nuclear fleet, enhancing plant reliability and substantially increasing electricity generation without adding new capacity. The Electric Power Research Institute (EPRI) states that, in the last 20 years, performance improvements in the US nuclear fleet were equal to building 27 new 1000 MW nuclear plants. Availability of over 93 per cent has been achieved in South Korea.

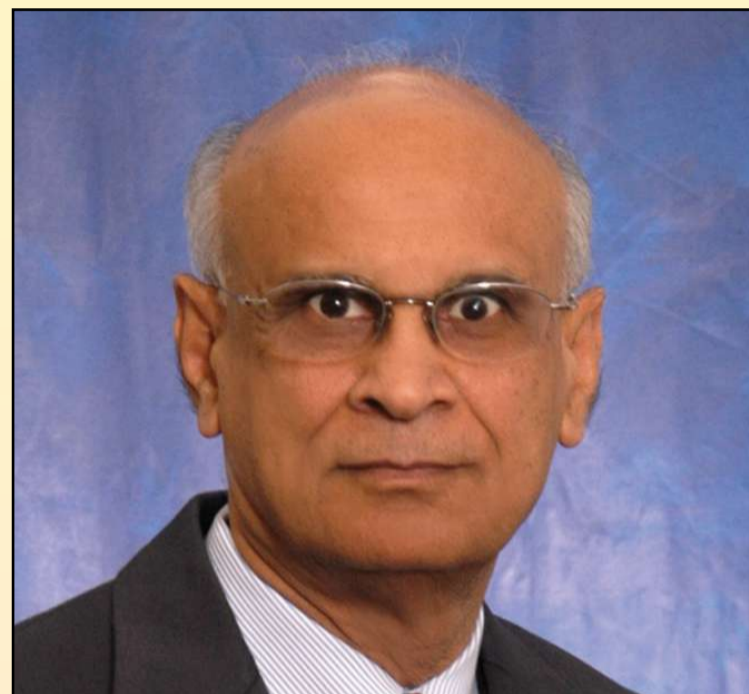
Meanwhile, public opinion on nuclear energy has become increasingly more positive over the last 30 years, with climate change concerns giving an added impetus to nuclear because of its near-zero CO<sub>2</sub> emissions footprint. If targets for CO<sub>2</sub> emissions are to be met, nuclear is an inevitable part of the future energy mix. Its share of worldwide power generation, presently at about 15 per cent, is expected to grow to roughly 25 per cent by 2020.

## Properly designed coal plants can and do meet the demands of utility systems for fairly rapid and wide variation in load

As more nuclear units come on line, strong business drivers exist for using them for base load operation due to low incremental fuel cost and operating limitations. As a result, other coal-fired/gas-fired units in the system must be capable of changing load more frequently and more rapidly, including complete shutdown at night or during periods of low system demand.

Nuclear faces plenty of challenges, such as high initial cost, local opposition to new plants, and difficulty of establishing a politics-proof consensus on a long-term storage strategy for radioactive waste. From a nuclear fuel sustainability viewpoint, the issue of nuclear fuel recycling must also be addressed.

**Gas turbine combined cycle (GTCC):** Before the US gas bubble burst in 2005, North America added close to 200 GW of gas-turbine-based combined cycle (GTCC) generation capacity. This was driven by low gas prices of \$2-2.5/GJ, rapid advancements in gas turbine technology leading to a combined cycle efficiency of nearly 60 per cent LHV, shorter construction schedule (roughly half that of coal-fired power plants), and quick-start capability. Further, a GTCC plant emits 55 per cent less



**Ram G. Narula: the argument that SCPC-fired power plants cannot rapidly follow load to complement wind is an over-simplification of the operation of a utility system**

CO<sub>2</sub> than a supercritical coal-fired power plant.

At the height of gas prices (approaching \$13/GJ in 2007), the installed capacity of gas-based generation in the US was equal to or slightly higher than coal-based generation, yet it accounted for less than 20 per cent of electricity generation compared to over 50 per cent by coal. While a GTCC plant is more 'environmentally friendly' and has many other advantages over a coal facility, the gas price volatility makes it unattractive on a longer term basis. Given the recent collapse in gas prices

The changes in pressure, temperature, and relative metal expansion from cycling of load or on-off operation are major factors in determining the stresses imposed on various components and their operating life. To minimize the adverse impact of cycling on plant operation and maintenance cost and reliability, the plant must be designed and operated to meet the intended objectives.

Modern once-through supercritical coal-fired power plants are designed for sliding-pressure operation, generous boiler/turbine bypass systems, and appropriate water chemistry. Properly designed coal plants can and do meet the demands of utility systems for fairly rapid and wide variation in load, including complete shutdown and restart, and without sacrificing heat rate or cyclic life.

Flue gas emissions control systems have advanced considerably over the last 30 years. Modern supercritical and ultra-supercritical coal plants are capable of achieving very low emissions. Older power plants are being gradually retrofitted to achieve similar results. Co-firing of biomass in new and older plants is also being implemented to lower the carbon footprint of coal plants.

In conclusion, all forms of energy must be brought to bear – including nuclear, coal, gas, and renewables – to combat climate change provide secure and affordable power for the two billion people worldwide who have no access to commercial energy. Coal-fired power plants can be designed to successfully follow load. They are competitive economically and offer availability well in excess of 90 per cent. Large utilities generally want to have a well-balanced portfolio of generation technologies. The reality is that coal will continue to be an important player for the foreseeable future in the carbon-constrained environment.

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and the coal-under-fire scenario pending regulatory uncertainty about CO<sub>2</sub> emissions, the GTCC option looks tempting again and may be the fuel of choice to meet near-term energy demand.

**Supercritical pulverized-coal (SCPC):** Some argue that SCPC-fired power plants cannot rapidly follow load to complement wind. First, this is an over-simplification of the operation of a utility system. Each utility system has daily as well as seasonal variations in the load demand, and actual generation must be adjusted accordingly. This adjustment is done by bringing units up and down, as well as cycling other units. The utility must satisfy its base load, mid-range load, cycling, and peaking requirements.

Typically, assets such as nuclear and coal are used to meet base load generation because of their lower operating cost. Coal units have historically been designed for daily start-up and shutdown and operate at part loads to support two-shift cycling operation. An analysis of selected older coal-fired plants conducted by a reputable engineering services company has shown them to be more rugged and cost effective to cycle than the newest combined cycle plants.

## Fuel Watch

## Oil

# Fundamentals provide little support for \$80/b crude price

■ Demand for crude oil in developed countries has “peaked.”

■ World oil demand still negative

David Gregory

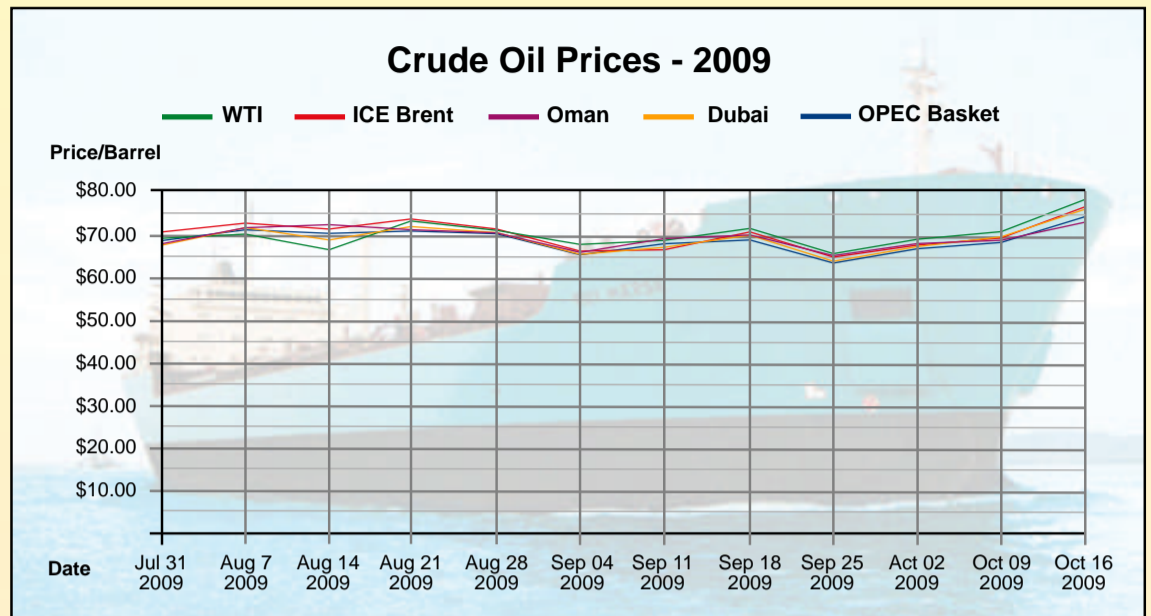
The price of West Texas Intermediate (WTI) touched \$80/b during intraday trading on October 20, the highest price reached during the course of 2009. The last time WTI was at the \$80/b mark was in mid-October 2008, when it was on its way down to \$30/b at the turn of the year.

A weak US dollar and improving sentiment about prospects for economic recovery were seen as the reason behind crude's movement out of the \$65-75/b range, where it has spent most of the summer – the result of a dismal summer driving season in the US. Despite the enthusiasm shown by investors, the fundamentals have yet to give crude oil the support that would warrant current prices.

In their latest monthly reports on the

oil market, the International Energy Agency (IEA) and OPEC make slight increases in their forecasts for growth in crude oil demand. Most of this demand will come from non-OECD countries, primarily Asia, where economic recovery is thought to be taking hold. But demand will not be as strong in the developed OECD countries, and according to a report recently released by IHS Cambridge Energy Research Associates (IHS CERA), demand for crude oil in developed countries has “peaked.”

“While world oil demand is now set to grow as the world economy moves from recession to recovery, the demand lost in 30 developed countries that make up the OECD is not likely to ever be regained,” the IHS CERA report said. Currently, the OECD accounts for 54 per cent of world oil



demand, but the report said, the key factor making it unlikely for OECD to ever return to its 2005 peak is that petroleum demand in the transportation sector – which is 60 per cent of OECD demand – is likely to flatten out after years of steady growth.

“Petroleum for transportation has been the single driving force behind OECD oil demand for the past two decades,” the research group's director for global oil, Aaron Brady, said in a statement announcing the release of the report. “Now we are seeing the tempering of the last significant driver of oil demand in developed countries – petroleum for transportation.”

In its October monthly report, the IEA increased its forecast for global oil demand by 200 000 b/d in 2009 to 84.6 million b/d and by 350 000 b/d for 2010 to 86.1 million b/d.

The IEA said this latest forecast was made “on the back of more optimistic economic assumptions by the International Monetary Fund and stronger-than-expected preliminary data in OECD North America, non-OECD Asia and Latin America.”

Oil demand in the OECD is forecast to average 45.4 million b/d in 2009 and 45.5 million b/d in 2010.

The forecast for non-OECD oil demand was also adjusted upward for both 2009 and 2010, following a reassessment of demand prospects in Asia (China, Chinese Taipei, India, Indonesia, Malaysia and Singapore) and Latin America (Brazil), as well as much higher economic forecasts. For the non-OECD, demand is expected to reach 39.2 million b/d in 2009, compared to 38.7 million b/d in 2008. In 2010, non-OECD is forecast at 40.6 million b/d.

On the supply side, the IEA reported that global oil supply rose by 310 000 b/d in September to 84.9 million b/d, driven by increased output by non-OPEC producers.

Non-OPEC crude production should average 51.0 million b/d during 2009, rising to 51.6 million b/d in 2010.

The IEA said that the ‘call’ on OPEC crude for 2009 and 2010 would be 28.4 million b/d.

For its part, OPEC said in its October oil market report that demand for

OPEC crude is estimated to average 28.6 million b/d in 2009, around 0.1 million b/d above the group's last report. “This still represents a considerable decline of 2.3 million b/d compared to the previous year,” OPEC said about its own production. During 2010, demand for OPEC crude is expected to average 28.4 million b/d.

“The world oil demand forecast for this year is not as bad as previously expected,” OPEC said. Noting the US crude consumption is rebounding from a steep historical decline, OPEC said it had revised its forecast for 2009 world demand by 0.2 million b/d to 84.24 million b/d, down by 1.4 million b/d from 85.65 million b/d in 2008. But it added that despite the large improvement in US oil demand, world oil demand is still negative in the third quarter, contracting by 520 000 b/d year-on-year.

OPEC forecast world oil demand to average 84.24 million b/d in 2009 and 84.93 million b/d in 2010, and it said that economic recovery would continue to be “slow and weak” throughout 2010.

## Gas

# Iran attempts to rekindle interest in South Pars

Several foreign firms backed away from South Pars LNG projects last year amid political pressure. Now Iran is sending signals that these projects – requiring billions of dollars of investment – are back on course.

Mark Goetz

Statements by officials in the Iranian government in recent weeks suggest that foreign oil companies Total, Shell and Repsol have renewed their interest in Iran's South Pars LNG projects.

For all its interest in developing its huge natural gas reserves – the second largest in the world – Iran is encumbered with a host of financial and political problems that prevent foreign investors from sinking money into its gas reserve development. Several foreign firms including Royal Dutch Shell, Norway's StatoilHydro, Spain's Repsol and France's Total all backed away from South Pars LNG projects last year amid political pressure stemming from Tehran's pursuit of a nuclear energy programme, which

many western countries claim is camouflaging research into nuclear weapons.

Now, however, Iran is sending signals that these projects – requiring billions of dollars of investment – are now back on course. This comes amid recent growing political activity amongst the US and European countries to introduce further international sanctions against Iran following the recent disclosure of a second nuclear research facility in the country.

In early October, the Iranian media reported the managing director of the National Iranian Gas Exporting Company, Reza Kasaizadeh as saying that talks with France's Total on its participation in Phase 11 of South Pars development – the Pars LNG project – had taken place in Tehran and that

further talks between Total, the National Iranian Oil Company (NIOC) and the China National Petroleum Corporation (CNPC) focusing on Total rejoining the project were expected soon.

Iran signed CNPC up for the project last March under the terms of a \$4.7 billion agreement following Total's initial withdrawal. According to Iranian officials the talks to come would concern CNPC as the upstream developer and give Total responsibility for downstream operations – the LNG plant.

Several days after the announcement about Total, the Iranian media announced that talks between NIOC and Royal Dutch Shell and Spain's Repsol had taken place regarding their participation in Phases 13 and 14 – Persian LNG. “Negotiations with Shell

and Repsol in recent weeks have gone in the desired direction and efforts are being made to take action as quickly as possible given the mutual interests in this field,” Seifollah Jashnsaz, managing director of NIOC was quoted by the Iranian student news agency, ISNA.

Shell and Repsol, which like Total, announced last year that they would prefer to delay their participation, have yet to comment on the announcements made in Iran. A spokeswoman for Total has said: “We have no comment to make. However, Iran remains a country of interest to us in the long term,” according to Reuters.

Iran's gas reserves gives it the promise of acquiring the same standing in international markets as Russia or Qatar. However, it is dependent upon

the participation of western energy firms to provide it with the LNG technology and expertise that it needs to reach its goal of eventually producing 37 million tons/year of LNG from South Pars. Yet at this time there appears to be little chance of any genuine progress being made soon in light of Iran's domestic troubles and existing international sanctions.

The new round of talks with western companies is not expected to give new impetus to the projects. Rather, it appears that Iran is hoping to show the world that it is not as isolated as Washington and Brussels would like and that there remains a degree of normalcy within its energy industry. Furthermore, Total, Shell and Repsol are likely continuing with talks in the hope that someday all this ugly politics will be gone, and they can proceed with pursuing their own interests.

Iran depends on fuel imports for 30 per cent of its domestic needs due to a lack of refining capacity despite huge crude reserves. The government continues to subsidize the cost of gasoline and diesel to the point that a litre of gasoline sells for 10 US cents. Since 2005, subsidized fuel has cost the Iranian government around \$130 billion.

By contrast, Iran's new oil minister Massoud Mir Kazemi recently stated that only \$3 billion has been budgeted for ongoing oil and gas projects that require an investment of \$19 billion.

# Solving the storage part of the CCS equation

Some argue that the future use of coal has to go hand-in-hand with carbon capture and storage. However, the storage part of the CCS equation is an area with many question marks.

**Dr David Clarke**

Energy efficiency measures, renewable energy and nuclear power will all contribute to UK and global reductions in CO<sub>2</sub> emissions but energy security, intermittency management and the long life-time of current fossil fuel generation plant means fossil fuel based power generation is likely to remain a key part of the energy mix for the foreseeable future.

With the challenge of achieving an 80 per cent reduction in UK emissions of greenhouse gases by 2050, fossil fuel based generating plant, as well as large industrial installations which are major CO<sub>2</sub> emitters, will require carbon capture and storage (CCS) to be implemented.

The development of effective CO<sub>2</sub> capture technologies, an infrastructure to pipe the CO<sub>2</sub> away and gaining experience and confidence in the use of CO<sub>2</sub> storage sites will be key to meeting these reduction targets in the UK and the rest of Europe.

The Carbon Sequestration Leadership Forum (CSLF), which met in London in October agreed that more than 20 industrial scale CCS demonstrations could be needed worldwide by 2020 as the initial step in a wide-scale roll-out of CCS. There was also the strongest signal yet that CCS must be incentivised as part of a global climate deal in Copenhagen this December.

The key first steps in making CCS a reality in the UK are now being made through the planned large-scale demonstration projects such as recent announcement of EU support for the Hatfield IGCC based demonstrator.

Recognising the importance of CCS to the UK, and the challenges of achieving a widespread deployment of CCS technologies, many of which are not yet fully mature, the Energy Technologies Institute (ETI) has identified CCS as one its major programme areas.

The ETI is a UK-based company formed by global industries and the UK government. It brings together projects and partnerships that create affordable, reliable, clean energy for heat, power and transport with the aim of meeting the UK's target of an 80 per cent reduction in CO<sub>2</sub> emissions by 2050.

In its CCS programme the ETI is looking over the immediate horizon to what the technology and infrastructure requirements will be when there is the likelihood of widespread implementation of fossil fuel generation with CCS from 2020 and towards 2050.

Compared to today, energy affordability needs will drive development of lower cost CO<sub>2</sub> capture technologies with higher performance. However, as we developed the ETI CCS strategy in 2008, it became clear that the first priority was to get more confidence that the UK has sufficient capacity to store captured CO<sub>2</sub> safely and effectively.

Overall storage requirements will depend on the amount of fossil fuel-powered generation in the future energy mix, but ETI analysis suggests that storing CO<sub>2</sub> from power generation and major industrial emitters for the next 100 years would require around 30 gigatonnes of storage capacity. The UK potentially has a large amount of storage capacity for CO<sub>2</sub>, under the sea bed in the North Sea and other locations around its shores. But how large is 'large'?

From studies completed to date, it seems pretty certain that there are at least a few gigatonnes of capacity available, ample to store the CO<sub>2</sub> from the planned demonstrators and the next few power stations built. But beyond that, current estimates vary widely. Some estimates suggest that there is little more than a few gigatonnes while others say there is enough capacity in the North Sea to store all of the UK and mainland Europe's emissions for several hundreds of years.

To resolve this debate and establish the opportunity for the UK the ETI has implemented its recently announced £3.5 million UK CO<sub>2</sub> Storage Appraisal Project (UKSAP).

UKSAP aims to provide a comprehensive picture of all potential UK offshore storage areas and therefore a more accurate picture than ever before of how much storage space is practically available.

There are two main types of storage space – oil and gas reservoirs which have, or will have, ceased production in the near future, and other geological formations deep below the sea bed, primarily 'saline aquifers' – porous rocks which currently contain salt water. Because of the history of oil and gas production, the first of these opportunities is reasonably well characterised. However, saline aquifers have received less attention, and make up the bulk of potential capacity.

The process of making an estimate of practically usable capacity in a region or the UK as a whole involves four steps:

- n Splitting the overall volume into identifiable storage 'units';
- n Calculating the pore volume of each unit;
- n Determining what fraction of that pore volume can be practically used for CO<sub>2</sub> storage;
- n Determining what the economics of various storage sites are (e.g. a large storage site near to shore is likely to be more economically attractive than a distribution of small sites a long way offshore in deep water).

**The next few months promise to be a very challenging and exciting time in CCS as results start emerging from the ETI's first projects**

Undertaking the first two steps in a comprehensive manner around the UK is the first critical stage in UKSAP. Previous studies have concentrated on specific geographic areas such as the southern North Sea. For the first time the UKSAP will consider all the potentially usable offshore storage units, using a consistent methodology for all. UKSAP will be accessing the best data available and fortunately there is an enormous amount of useful data available, a legacy of extensive oil and gas exploration and production in UK waters.

However, the real key to the project will be in addressing the third step. There is a large number of factors which can influence the fraction of pore space which is usable, including what will happen to what is already occupying the pore space, the risks that the store might leak due to geological faults or how fast CO<sub>2</sub> can be practically injected into the site.

To undertake this ambitious project, the ETI has brought together the



**Dr David Clarke:**  
all the indications are that storage in suitable sites will be safe

leading UK industrial and academic players currently involved in offshore CO<sub>2</sub> assessment into the UKSAP consortium, from experts in geosciences to organisations experienced in the rating, design and operation of offshore assets.

UKSAP is led by Senergy Alternative Energy, a leading subsurface CO<sub>2</sub> consultancy. Geoscience activities are led by the British Geological Survey (BGS), renowned worldwide for its CCS expertise. BGS will be supported by University of Edinburgh, part of the Scottish Centre for Carbon Storage, who led the recent study of the Scottish sector of the North Sea. The Durham CCS Group (Durham University, GeoPressure Technology Ltd and Geospatial Research Ltd) will bring its expertise in risk analysis.

RPS Energy brings its reservoir

to test the feasibility of CO<sub>2</sub> storage in depleted oil and gas reservoirs and saline aquifers. These include the Sleipner and Snohvit fields in the Norwegian sector of the North Sea and In Salah operated by ETI Member BP in Algeria.

All the indications are that storage in suitable sites will be safe. Storage will be subject to strict national and international legislation, which is currently under development. A great deal of work is ongoing into how storage sites can be monitored to ensure that we know what is happening to the CO<sub>2</sub>, both during and after injection. This is known as Monitoring, Measurement and Verification, or MMV.

A range of technologies exist to measure where the CO<sub>2</sub> is and check that no leakage is occurring, but much of the MMV work so far has been on onshore storage sites. MMV requirements for the UK may differ because of the expected predominance of offshore sites, the specifics of UK geology and the requirements of UK/EU legislation. This is why the ETI has launched a parallel project to UKSAP, led by BGS, to review UK MMV requirements and current technologies. The project aims to identify priorities for MMV technology development or adaptation for UK needs. BGS will report back to the ETI in spring 2010.

The next few months promise to be a very challenging and exciting time in CCS as results start emerging from the ETI's first projects and as priorities for other CCS focus areas are firmed up and other projects launched.

Achieving the UK target for reducing CO<sub>2</sub> emissions by 80 per cent by 2050 demands an integrated approach to energy generation, distribution and usage across the key sectors of power, heat, transport and the associated infrastructure systems. Development and deployment of effective, affordable CCS systems will be a critical part of delivering this integrated future for the UK energy system.

*Dr David Clarke is Chief Executive of The Energy Technologies Institute.*

engineering expertise to lead the dynamic simulation activities, supported by Heriot-Watt University and Imperial College. PGS and IHS will make their commercial databases available to the project. Economic aspects will be covered by Element Energy Ltd, which has been involved with a number of earlier studies. To complement these, the ETI will bring in the expertise of its members, including BP, Shell, E.ON and EDF, to support the project team and keep a strong industrial focus in the project.

The project started in October and will be completed by March 2011. Whilst many capacity studies have been completed around the world, it is believed that this will be the first time such a comprehensive assessment will have been made at a national level, and UKSAP will put the UK at the leading edge of such assessment.

A key question is whether underground storage of CO<sub>2</sub> is safe and secure. Many demonstration projects are being run around the world

# Making the most of the sunshine

In September last year, ABB completed delivery and commissioning of the 1 MW Totana photovoltaic power plant. Journalists recently had the opportunity to visit the plant to witness a range of new optimization technologies that will help increase performance.

**Junior Isles**

The region of Murcia, Spain has a mild climate with very little precipitation. It averages more than 300 days of sun per year, making it an ideal location for solar power generation. Global Capital Finance (GCF) an international investment banking and financial services firm, is now set to make money while the sun shines with the start up of a solar power plant called Totana.

Although Totana is one of many solar projects to begin operation in Spain in the last 12-18 months, it is anything but just another solar plant. From the start, the project was driven by GCF's desire to have the shortest payback time for the project.

Notably, the project was delivered on a turnkey basis by ABB in just four months, which enabled GCF to meet the deadline for receiving the maximum feed-in-tariffs.

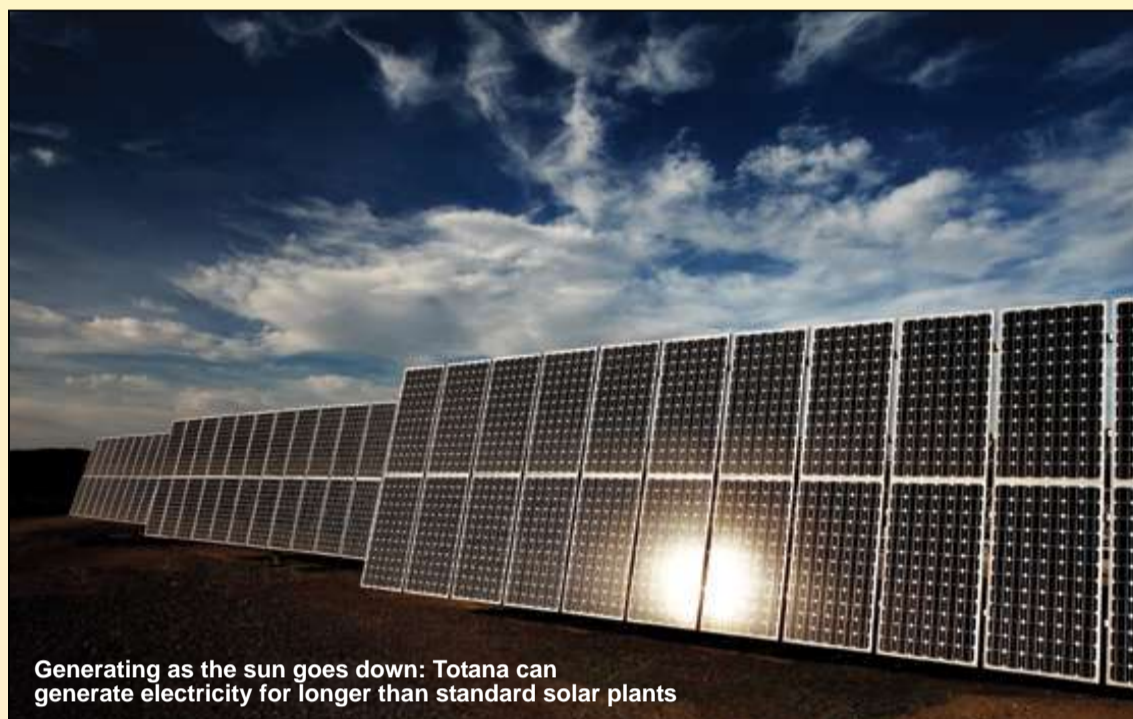
But more interesting is the choice of technology. Since its initial start up about one year ago, it has been demonstrating a combination of new technologies developed by ABB that will help deliver a plant performance ratio peak of nearly 80 per cent, higher than average industry standards for such applications.

The solar modules feature sophisticated software and solar trackers that make continual adjustments to exactly align the solar panels with the sun's position in order to maximise the amount of electricity that can be drawn from the sun.

Sergio Asenjo, manager for ABB's power generation business in Spain and Portugal and head of the solar power business in ABB Power Systems, explains: "This is a highly integrated plant with a huge amount of automation. There is an innovative system to optimise the plant operation that includes an inverter control system that optimises the switching of the individual inverters according to the sunlight conditions."

Totana has more than 6000 solar photovoltaic (PV) monocrystalline panels supplied by Zytech Solar of Spain. The panels are connected to provide a total generating capacity of 1 MW. Each PV panel has a sunlight conversion efficiency of around 14 per cent.

According to ABB, the plant has an



Generating as the sun goes down: Totana can generate electricity for longer than standard solar plants

average performance ratio of 77.8 per cent. This is a measure of the electrical energy connected to the grid divided by the irradiance of the sunlight received by the panels. Plant performance ratio is the key variable in measuring the efficiency of a photovoltaic power plant. It measures the actual yield of the plant in relation to the theoretical yield. Actual yield can be diminished by a number of

factors like poor light, cloud shadowing, dirty PV cells and malfunctioning equipment. This high performance ratio is attributed to the "mechanical" and "electrical" design of the plant. "The mechanical portion is the tracker and the panels. These are equivalent to the turbine and boiler in a thermal plant,"

**In addition to maximising performance, it is important to inject power into the grid for as much time as possible. A key differentiator of our technology is the dynamic allocation of the panels**

weak or low sunlight.

The electrical design relates to the design of the cable layout, cable sections and power electronics, combined with an automation system that has the intelligence to determine the optimum configuration for maximum power output.

The cable design involves around 100 m of cable arranged with an optimal cable section and layout to optimise the DC power transmission. "The DC design is crucial to avoid voltage drops," says Asenjo.

The other role of the automation system is to maintain the maximum availability of the plant. As Asenjo explains: "In addition to maximising performance, it is important to inject power into the grid for as much time as possible. A key differentiator of our technology is the dynamic allocation of the panels. We have the flexibility to switch, within certain limits, solar panels to different inverters. This optimises the operation of the inverters so that each panel always works at maximum load."

An inverter is an electrical device for converting direct current (DC) into alternating current (AC). The new inverter system at Totana has been developed to combine high performance with reliability and competitive pricing.

The inverter was developed from experience gained from ABB Finland's development of frequency converters and related power control systems. "A frequency converter is essentially half of an inverter since the goal is to

convert DC to AC. The related power electronics is very similar. We also collaborated on developing the software to optimise the operational point of the inverter."

The willingness of GCF has given ABB the opportunity to fully test the inverter, switching it on and off on an hourly basis each day. ABB is satisfied with the operating experience so far. "There have been no trips. The inverter runs as soon as the system is connected. There is some software adjustment of the algorithm for optimising the working point. The power electronics has been working with full reliability without any problems in terms of grid stability."

The automation system controlling the dynamic allocation of the solar panels at Totana has allowed Global Finance to operate the plant for about 15-16 hours/day in summer and about 10 hours/day in winter. This equates to approximately an extra 40 minutes per day compared to standard plants. At a 1 MW peak, this allows the company to generate an additional 600 kWh/day compared to a standard plant under the same conditions.

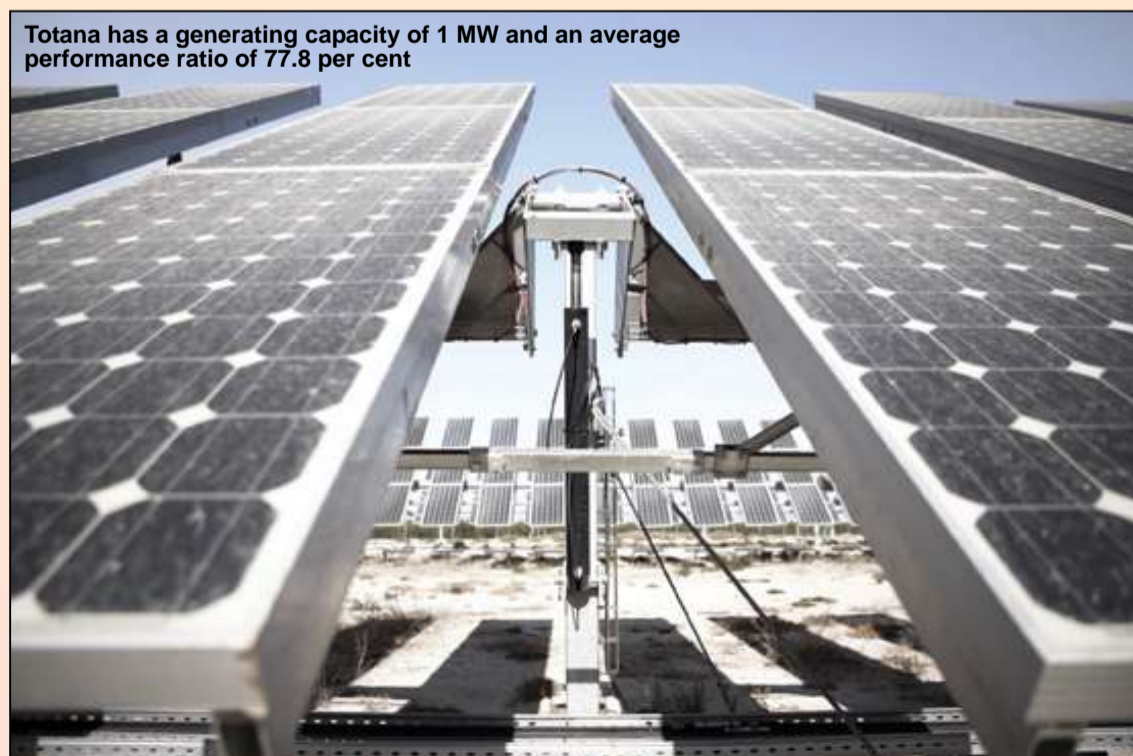
ABB is hoping to sell this new technology to customers who are prepared to include the additional cost of the system into their financial model.

"This extra generating ability can provide considerable additional revenue over the 20-25 year lifetime of the plant."

With the price of solar panels now about half of what they cost one year ago, industry estimates currently put the capital cost of a 1 MW PV plant at around €3 million for fixed installations. A plant with a tracking and automation system such as that installed at Totana might add just over €1 million depending on the tracking system.

Plant owners typically look for a return on investment of 12-15 per cent. This, according to Asenjo, calls for a plant with a performance ratio of about 80 per cent. "This would give a payback period of 7-8 years. It can make economic sense to spend a bit more on initial capital cost in order to get a higher return on investment," he concludes.

As long as the sun keeps shining, the price of the new technology at Totana looks set to be a sound investment.



Totana has a generating capacity of 1 MW and an average performance ratio of 77.8 per cent



Junior Isles

# There will be no 'Real Deal'

It would be a pleasant surprise to see government leaders attending the COP15 Climate Change Summit in Copenhagen next month agree on a new climate deal to replace Kyoto – not a deal that packs no punch but one that has short, medium and long term targets for carbon reduction balanced against the need for energy security. Unfortunately the chance of securing such an outcome would, in fight terms, be as unlikely as scoring a spectacular last round knockout.

Even the eternal optimist, Yvo de Boer, the UN's climate change chief, seems to be admitting that the final bell will come too soon. In a recent interview with the *Financial Times* he accepted that with the limited time now available before Copenhagen, "we have to focus on what can be realistically done and how that can be realistically framed".

He added that there needs to be a decision in Copenhagen "that sets out individual targets for industrialised countries, that decides how major developing countries intend to engage [in curbing emissions by] 2020, and hopefully that puts in context a long term goal of cutting global emissions by 2050."

Such language clearly suggests that Mr de Boer expects Copenhagen to deliver the bare minimum, i.e. it will not go much further than where we are already. Most of the industrialised countries, with the notable exception of the US, have already set their targets and how they will be achieved. At the same time, setting a long-term goal is always easy for political leaders who tend not to think past the next election.

This view was recently echoed by Luc Werring, a former official for the European Commission. Speaking as a senior adviser with Hill & Knowlton on the sidelines of the *5th Emerging Europe Energy Summit* in Prague, he said: "They will probably set targets for 2050 and agree to continue dialogue."

There have been the proverbial green shoots of progress in recent weeks from the developing countries, which have softened their stance a little in

the run-up to next month. Throughout October, European officials have said "the language of the discourse" on technology transfer had changed.

Instead of demanding the transfer of intellectual property, developing countries are now willing to discuss collaborating on the development of low carbon technologies. Already we have seen this with a number of recent announcements on joint project developments between companies like Duke Energy of the US and China on technology such as IGCC.

But there are still a number of hurdles in persuading developing countries to sign an agreement, one of which is financing to help developing countries combat climate change. Recent estimates by the World Bank placed the bill at \$75-100 billion annually till 2050 for the developing countries to cope and adapt to the effects of global warming.

ensures that the richer nations will continue to have a greater say in the manner in which funds are disbursed to developing nations.

Notably, China and India recently signed an agreement to coordinate their efforts on climate change. At the heart of that agreement is a demand that the developed world must take the lead in cutting global emissions.

Unfortunately, as we go into Copenhagen, there will be no "taking the lead" by the world's richest nation, the US. And there can be no real deal while the US continues to debate its climate change bill in the Senate.

The Obama Administration certainly has good intentions in terms of being part of a global accord, unlike the Bush government, which refused to be part of the Kyoto agreement. In remarks prepared for delivery at a United Nations meeting on climate change in New York in September,

## ... There can be no real deal while the US continues to debate its climate change bill in the Senate

There is still a huge difference between the views of the developed and developing countries on the issue. The extent of the gap to create a new financial architecture was reflected in the contrasting views expressed in a discussion paper on financing climate change during UN climate change talks in October.

Developing countries want the new mechanism to be placed within the ambit of the UN Framework Convention on Climate Change (UNFCCC), enabling its members who are party to the international treaty to combat global warming to have a fair say in the disbursement of funds.

Proposals from negotiators of the developed world argued differently, placing more confidence in international financial institutions like the World Bank and the existing Global Environmental Facility, a partnership of some UN agencies and the Bank, to guide climate change financing. This financial arrangement

president Obama said: "We understand the gravity of the climate threat. We are determined to act."

While we can believe in the sincerity of his determination to act, the question is: when will the real action begin? At the beginning of October, president Obama's top energy adviser said there is no way Congress will be able to pass a bill on climate change this year.

At a conference organized by *The Atlantic* magazine, Obama's senior climate adviser, Carol Browner said: "Obviously, we'd like to be through the process, but that's not going to happen. I think we would all agree the likelihood you would have a bill signed by the president on comprehensive energy by the time we go early in December is not likely."

The US Senate began hearings at the end of October on a climate bill that aims to cut the nation's emissions by 20 per cent by 2020. On completion of the hearings, the Senate Environment and Public Works

Committee aims to mark up the bill within the first two weeks of November. Earlier, Senator Harry Reid, (D-Nevada) had indicated that floor consideration of the climate bill might be pushed into the new year.

With Congress moving so slowly, the US is likely to find itself with little influence when the 120 countries convene in Copenhagen. Browner disagrees saying that the US could still take a leading role at the Copenhagen talks, even without a new climate law. "We will go to Copenhagen and manage with whatever we have," she said.

She and everyone else will have to. It is unfortunate that after so many years of debate and political manoeuvring, we will end up with a new global climate deal that will not deliver the cuts that the scientist say we need.

Perhaps if we want to see a 'real deal', we should look no further than Atlanta, USA, home of the former legendary heavyweight boxing champion of the world, Evander 'the Real Deal' Holyfield. Non-fight fans may know him best as the boxer who had part of his ear bitten off by 'Iron' Mike Tyson.

While Iron Mike gathers rust, the 'Real Deal' is doing his bit for the planet. Holyfield plans to build a solar energy farm on 40 acres of his property in Fayette County. The project, which is in the preliminary stages, would generate solar power for commercial sale, and would take six to nine months to complete, according to Deborah Pointer, who says she helped put the deal together for Holyfield.

Holyfield said his motivation for the project is "to do something right" by helping to combat global warming. "I've never had a problem being lean," Holyfield said, "now I'm the lean, green fighting machine."

If only those in the Senate and the key leaders in Copenhagen had the same fighting spirit and sense of responsibility as Holyfield, we might have actually had a chance of seeing a real deal in Copenhagen.

