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Korea sets out nuclear ambitions

Following its recent success in the UAE, South Korea is ramping up its nuclear ambitions, writes Junior Isles



Choi Kyung-hwan: contract was "fairly" won

Following its recent success in beating rivals from Europe, Japan and the US to secure a nuclear power plant contract in the United Arab Emirates, South Korea is now planning to become one of the world's top three nuclear power plant exporters in 20 years.

According to its Ministry of Knowledge Economy, the country plans to sell 10 nuclear power plants by 2012 and 80 plants by 2030, which would account for 20 per cent of the planned construction of power plants around the world.

The country hopes that the contract

to build four nuclear reactors in the UAE, the first such major export contract, will kick-start similar export deals in the future.

Under the current plan, the country will continue government-level efforts to strike plant deals designed to meet specific needs of different countries, and further secure independent technology to raise global competitiveness while nurturing experts, said the ministry.

Last month a Jordanian government energy official said it was in final negotiations with a South Korean consortium to build

Jordan's first small-scale nuclear reactor.

Ned Xoubi, chairman and project manager of the Jordan Atomic Energy Commission (JAEC) research reactor evaluation committee, told *The Jordan Times* that the JAEC is close to concluding financial and technical negotiations for the construction of a nuclear research reactor with a consortium representing the Korea Atomic Energy Research Institute (KAERI) and Daewoo Engineering and Construction.

Ongoing talks are focusing on

regulatory standards and a framework for the reactor, which will be used to train cadres for Jordan's peaceful nuclear programme, he said.

JAEC and the consortium will officially sign the agreement for the construction of the reactor in March, Xoubi said, noting that the two sides may carry out "limited preparatory work" before signing the contract, such as setting site selection criteria.

"We have selected around four optional sites within the Jordan University of Science and

Continued on page 2

Big nations meet COP deadline

- Targets submitted in the form of a range
- UN looks to change negotiating process

Most of the world's large economies have met the deadline set in Copenhagen for filing emissions targets. The submissions came despite the news in late January that the UN had effectively dropped the January 31 deadline by which time all countries were asked to officially state their emission reduction targets or list the actions they planned to take to counter climate change.

Many countries submitted the targets in the form of a range. For example, Australia will cut emissions by between 5 and 25 per cent by 2020, depending on what other countries agree.

Diplomats will now spend the coming months trying to persuade countries to agree to the upper end of their ranges. Governments will also now be working to transform the Copenhagen accord to a legally binding treaty, which they hope to do in a series of meetings culminating in a conference in Mexico late this year.

In late January, UN climate change chief Yvo de Boer had pulled back from the January 31 deadline saying that it was now a "soft" deadline, which countries could sign up to when they chose. "I do not expect everyone to meet the deadline. Countries are not being asked if they want to

adhere... but to indicate if they want to be associated [with the Copenhagen accord]. I see the accord as a living document that tracks actions that countries want to take," he told journalists in Bonn.

Just 10 days out from the deadline, only 20 countries out of 192 had signed up, with many unready or unwilling to put their name to the document.

De Boer also endorsed the idea of changing the traditional UN negotiating process of reaching agreement between all countries by consensus. Instead, he argued that a smaller group of countries could

negotiate a climate agreement on behalf of the many.

Since Copenhagen, the US and UK have argued that climate negotiations are best served by meetings of the world's largest polluters, such as China, the US, India, Brazil and South Africa. These countries, which emit more than 80 per cent of global emissions, signed up to a deal in the final hours of the summit.

Critics say that such a process, however, would be not only illegal but undermines negotiations already taking place among the 192 countries and threatens the UN's multilateral and democratic process.

(Continued from page 1)

Technology campus for the reactor. They will study and choose the best site and technology acceptable to Jordan," he said.

Xoubi stressed that although the deal marks South Korea's first export of nuclear technology, KAERI and Daewoo have extensive experience in constructing and operating full-scale nuclear power plants.

The reactor, expected to be operational in less than five years, will initially have a capacity of 5 MW and will be upgradeable to 10 MW without further construction, according to JAEC.

The research reactor is considered by officials to be an important precursor to the Kingdom's first nuclear power plant, a 750-1000 MW Generation III reactor to be built in an area southeast of Aqaba.

With plans in place to construct four nuclear power plants within the next 30 years, nuclear power has the potential to provide the Kingdom with up to 60 per cent of its energy needs by 2035.

With its involvement in building the research reactor, South Korea will be well placed to secure the contract to build these reactors.

Korea reportedly came under heavy criticism from Areva following its UAE success. In her first public comments since the UAE picked the South Korean consortium over Areva for the deal, Areva Chief Executive Anne Lauvergeon was quoted in *Le Monde* as saying the strong euro hurt Areva by inflating the costs for its reactors. She also blamed poor coordination among the French energy companies who bid alongside it, including Electricite de France, Total and GDF Suez.

"South Korea was ready to do anything to win, in terms of price and in state financing," Lauvergeon was quoted as saying.

Lauvergeon also blamed the slow reaction by the French partners to coordinate their bid. Abu Dhabi sought the participation of EDF to operate the reactors, but the state-controlled electricity giant only agreed to join at the last minute, under pressure from the French government.

Lauvergeon denied responsibility for the lost contract, saying: "I totally assume my responsibilities and those of Areva, but I won't accept those of others."

She said the strengthening of the euro against the dollar caused a 15 per cent increase in the cost of Areva's bid between the start of the bidding process two years ago and now. Areva offered four of its third-generation EPR reactors for \$30 billion, while the winning South Korean bid was for \$20 billion.

On securing the UAE deal, Knowledge Economy Minister Choi Kyung-hwan said that the bid was won "fairly", especially since South Korea enjoys a 20 per cent price advantage compared to other countries in this field. He did not elaborate on what measures were taken to persuade the Middle East country to select the Korean reactors, though he made clear there was no "dumping" of the power units involved.

Small businesses oppose US cap and trade proposal

With CO₂ emissions predicted to rise this year with economic recovery, pressure is on US legislators to push through a national climate bill. But recent surveys show that US businesses are opposed to a Federal cap and trade system being included in any such bill.

Junior Isles

The National Federation of Independent Business (NFIB) has released 16 state-based surveys that further highlight the political unpopularity of the proposed US Federal cap-and-trade system. The surveys follow two national surveys showing small business owner and voter opposition to the system.

Dan Danner, NFIB's president and CEO said: "The time is not right – either politically or economically – for a federal cap-and-trade programme that will cause more harm than good to the voters. Their concerns are clearly based on the burdensome economic problems that hit them at home – high unemployment, slow economic growth, and rising energy prices."

In its January monthly outlook, the US Energy Information Administration (EIA) said energy prices are slowly rising as major economies shake off the effects of last year's recession.

However, pressure on the US government to pass legislation to curb greenhouse gas emissions is set to increase after the release of official government figures warning that carbon emissions will bounce back this year.

The EIA also says that economic recovery means carbon emissions will rise over the next two years, making it harder for the US to meet its proposed target of cutting emissions by 17 per cent on 2005 levels by 2020.

The EIA's *Short-Term Energy Outlook* states that US carbon emissions fell by 6.1 per cent last year, led by a nearly 11 per cent fall in coal-based emissions. "Declines in energy consumption in the industrial sector, a result of the weak economy, and changes in electricity generation sources are the primary reasons for the decline in CO₂ emissions," it said.

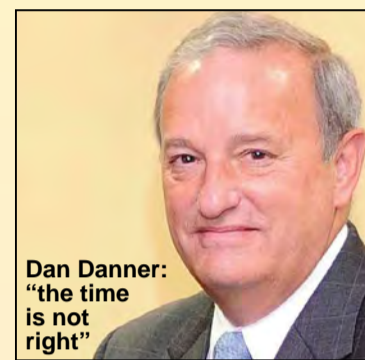
However, it predicts that economic recovery will contribute an expected 1.5 per cent increase in CO₂ emissions this year. "Increased use of coal in the electric power sector and continued economic growth, along with the expansion of travel-related petroleum consumption, leads to a 1.7 per cent increase in CO₂ emissions in 2011," it states.

At the end of last year, the EIA's *Monthly Energy Review* said renewable energy sources (i.e., biofuels, biomass, geothermal, hydroelectric, solar, wind) provided 10.51 per cent of domestic US energy production during the first nine months of 2009.

"When Congress resumes its debate on pending energy and climate legislation, it would do well to take note of the clear trends in the nation's changing energy mix," commented Ken Bossong, Executive Director of the SUN DAY Campaign. "Renewable energy has proven itself to be a solid investment – growing rapidly and nipping at the heels of the stagnant nuclear power industry – while fossil fuel use continues to drop." The SUN DAY Campaign is a non-profit research and educational organization founded in 1993 to promote sustainable energy technologies as cost-effective alternatives to nuclear power and fossil fuels.

Senior officials from Alstom Power, last month joined a chorus of voices calling on the US Congress to pass legislation that establishes greater certainty for businesses considering investments in technologies that will help limit CO₂.

Alstom, a member of the US Climate Action Partnership (USCAP), was one of a number of companies, environmental NGOs, labour groups, faith-based organizations, and others who signed a full-page advertisement in the *Wall Street Journal* in January calling for Congress to take action on



Dan Danner:
"the time is not right"

climate legislation as soon as possible.

Alstom Power President Philippe Joubert said: "Our customers tell us that uncertainty about the legal and regulatory framework around carbon dioxide emissions is holding back needed investments in the power sector. Investment to replace and retrofit ageing power plants and infrastructure are essential for security of supply as well as to tackle climate change. The US Congress and other national legislatures should act to establish such a legal framework as soon as possible. In the US, such legislation can help create skilled jobs, stimulate the economy, and safeguard competitiveness."

Clean technology venture investment falls in 2009

■ Venture capital investment falls 33 per cent

■ Solar hardest hit

Although venture capital investment in clean-tech fell 33 per cent in 2009 compared to 2008, it was not as hard hit as other sectors such as software and biotech according to research by Cleantech Group and Deloitte.

Preliminary findings show venture capital firms invested at least \$5.6 billion in clean technology in 2009 in North America, Europe, China and India, down from \$8.5 billion in 2008. Cleantech Group also said that 2009 is on track to be a record year for the number of clean-tech venture capital

deals, with 557 achieved so far.

The preliminary total is expected to increase by 5-10 per cent once investors fully announce their activity (as in previous years), which would make 2009 a record year for the number of clean-tech venture capital deals, and approximately equal to 2007 for total amount invested.

"Though much of the economy struggled in 2009, clean tech had a pretty good year," said Dallas Kachan, managing director of the Cleantech Group. "Clean-tech

went from being a niche category for investors to a dominant category, and 2009 will go down in the record books as a pretty good year."

The top clean-tech sector for venture capital investment in 2009 was solar, which accounted for 21 per cent of total clean technology investments. Transportation and energy efficiency – defined as lighting, green building materials, glass and smart-grid components like advanced metering – accounted for 20 per cent and 18

per cent, respectively.

The venture capital investment in solar, however, is widely seen as dropping off, with solar investment down 64 per cent in 2009 from the previous year.

"In 2009 there was a pullback and realisation by investors that because of the capital intensity of solar, there may be safer places to put their money," said Scott Smith, US clean tech leader for Deloitte. "There's still a lot of solar investments, but they are much smaller."

EU seeks energy cooperation with Iraq

The European Union (EU) is hoping that a recently signed memorandum of understanding (MoU) on energy with Iraq will lead to the country becoming a major gas supplier to Europe.

The EU Energy Commission said in a statement that the document provides a political framework for reinforcing energy relations between Iraq and the EU.

Iraq, with the world's third largest

proven oil reserves, is already an important supplier of oil and can become a key gas supplier for the Southern Corridor, said EU Energy Commissioner Andris Piebalgs. The Southern Corridor refers to pipelines needed to bring Caspian Sea and Central Asian gas to the EU with the Nabucco pipeline as the main part of the network.

The gas transit networks, including Nabucco and several other natural gas

routes, were envisioned by the EU to achieve energy security by diversifying its energy supply and reducing dependence on Russia.

"Iraq represents a vital link for the EU's security of (energy) supply," said Mr Piebalgs, who signed the MoU with Iraqi Oil Minister Hussain Al-Shahrastani in Baghdad, adding that the EU could help Iraq develop its electricity system and tap its vast

renewable resources.

The document outlines cooperation in developing an energy policy for Iraq, energy security of supplies between Iraq and the EU, renewable energy and energy efficiency.

In recent years, the EU has significantly strengthened its relations with partners in the Middle East and North Africa to diversify its energy supply.

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Koreans look to North American renewable energy market

Dalton McGuinty: "Ontario is becoming the place for green energy"



South Korea's ambitions on the international energy market are not limited to the nuclear sector, writes Siân Crampsie.

South Korean energy companies have gained a foothold in the rapidly-growing North American alternative energy markets through deals in Canada and the USA.

The South Korean government is to cooperate with the US state of Illinois in the development of smart grid technologies, while in Canada, two South Korean companies have signed a multi-billion dollar deal to develop green energy in the province of Ontario.

South Korea's Ministry of Knowledge Economy says that its minister Choi Kyung-hwan and Warren Ribley, head of Illinois's Department of Commerce, have signed a memorandum of understanding (MOU) to set up a pilot community in South Korea demonstrating smart grid technologies. They will also conduct

research and development (R&D) and the training of related personnel.

The pilot community will be located on Jeju Island and will be used to investigate the feasibility of existing smart grid technologies as well as operational models. The results will then be applied to smart grid projects in Illinois.

In a separate development Samsung C&T Corporation and the Korea Electric Power Corp (Kepco) have announced plans to invest C\$7 billion (\$6.1 billion) to develop wind and solar energy projects in Ontario.

The agreement will triple Ontario's output from wind and solar sources and lead to the creation of over 17 000 new jobs in construction and manufacturing. The first projects will be developed in southwestern Ontario,

according to the province's government.

The South Korean consortium will set up manufacturing facilities to support the projects. The deal gives it preferential treatment from the province in the form of priority access to the electricity grid and higher-than-market rates for the energy generated under Ontario's new feed-in-tariff programme.

Overall, some 2000 MW of wind projects will be developed alongside 500 MW of solar power facilities. The deal represents the single largest investment in renewable energy in Ontario's history.

"With this step, Ontario is becoming the place to be for green energy manufacturing in North America," said Dalton McGuinty, Ontario's Premier.

The province is planning to shut down all of its coal-fired power plants by 2014. It has already achieved a 73 per cent drop in carbon dioxide (CO₂) emissions from coal-fired power plants since 2003. Four coal-fired power units are due to be taken off-line this year.

The deal has been criticised by the Ontario Electricity Coalition (OEC), which says that while it supports green energy, private power deals will be more costly for consumers.

"Every penny of Samsung's mega profits will come out of the pocket of Ontario's electricity consumers and business owners," said OEC spokesman Paul Kahnert. "Ontario's public electrical utilities can buy, install and maintain made-in-Ontario windmills – without the likes of Samsung – at a much lower cost."

Chavez halts rationing in Caracas

■ Rationing causes upheaval
■ Blackouts will continue until May

Venezuelan President Hugo Chavez's decision to suspend electricity rationing in the country's capital after just one day has put added pressure on other areas in the country, according to local reports.

Chavez introduced a rolling blackout programme across the country in the face of severe electricity shortages in mid-January, but quickly revoked the measure in Caracas due to the chaos it created. He has also sacked the recently-appointed Electricity Minister Angel Rodriguez.

Media reports from Caracas indicate

that some zones in the city had their electricity cut for two four-hour periods in one day, while traffic signals were also affected resulting in chaos on the city's roads.

Other reports say that rationing has also been suspended in the western state of Merida after protests there against Chavez's government. There have also been protests in the capital over the electricity shortages.

The crisis is now seriously threatening Venezuela's economic recovery and undermining the Chavez government.

At the heart of the electricity

shortages is the worst drought in 50 years in the country, which has caused reservoir levels at the Guri dam to fall to emergency levels. The rationing programme is likely to last until May, when the rainy season starts.

However many in the country blame the government for mismanaging the electricity sector by failing to invest adequately. Corruption, poor energy efficiency and high levels of economic growth have also exacerbated the problem.

Chavez nationalised the country's electricity sector in 2007.

The Guri hydropower plant supplies three-quarters of Venezuela's power. As the electricity crisis began to emerge, the government passed a decree requiring a 20 per cent reduction in electricity consumption across the country and implemented rolling blackouts in January.

The power cuts are continuing to have a major impact on areas outside Caracas, according to local reports. Operations at industrial facilities have stopped, transport systems have been affected, tourism has been hit and university classes are being cancelled.

Angra 3 construction restarts

Construction activities at Brazil's third nuclear power unit are due to restart this month after years of delays.

The country's nuclear energy company Eletronuclear announced in January that building work would restart at Angra 3 this month (February). Work had been due to commence in December last year but was postponed when the local government revoked the construction license.

The plant is now scheduled for

start-up in July 2015, according to Eletronuclear.

The news on Angra came as Brazilian President Luiz Inacio Lula da Silva signed into law a motion on the creation of a national policy on climate change.

The new law establishes a goal of reducing the national emission of greenhouse gases by between 36.1 per cent and 38.9 per cent by 2020. It had been opposed by Brazil's Ministries of Energy and Environment and vetoed three times

before being signed by the President.

The Energy Ministry opposed the law on the basis that it proposes the replacement of fossil fuel fired power plants. Brazil in the past has suffered from energy shortages caused by an over-reliance on hydropower-based resources.

The government's plans include the expansion of Brazil's nuclear power plant fleet in order to boost thermal electricity generating capacity without increasing greenhouse gas emissions.

Construction of the 1270 MWe (net) Angra 3 unit is to be completed by Areva. The Brazilian government is also planning to build two new nuclear power plants in the northeast of the country and two more near Angra in the southeast.

The addition of up to 8 GWe of new nuclear capacity is envisaged by 2030, and by 2060 the government hopes to have 60 GWe of nuclear capacity installed, according to the World Nuclear Association.

Pickens halves GE order

■ Transmission remains key issue
■ RES required for investors

The USA's renewable energy industry is continuing to put pressure on the government to enact a national Renewable Electricity Standard (RES) in order to give investors and developers more long-term certainty.

The American Wind Energy Association (AWEA) says that a national RES would work in synergy with the short-term measures of the American Recovery and Reinvestment Act (ARRA) to underpin investment in new manufacturing facilities and training.

The organisation says that ARRA has provided the country's wind energy industry with a "lifeline" but that more long-term measures are needed if wind energy is to continue to provide the country with the second-largest source of new generating capacity for a sixth year in a row.

AWEA's latest analysis of the market came as Texan entrepreneur T. Boone Pickens cut a massive order for wind turbines from GE in half.

The energy investor has made wind power a key part of plans to reduce the amount of oil consumed by Americans but said that a drop in natural gas prices and a lack of transmission lines in Texas was behind his decision. He will now take delivery of 300 turbines from GE, for use in wind farms in Canada and Minnesota.

In 2008 Pickens' firm Mesa Power ordered 667 wind turbines from GE for the first phase of the proposed 4000 MW Pampa wind project in Texas. Pickens says that he will go ahead with this project when suitable transmission lines are in place.

AWEA says that while federal transmission policy is under heated discussion as part of pending energy legislation, states and regions are where key decisions are made in terms of transmission investment. "Texas and the Southwest Power Pool are beginning to see investment in new transmission lines and infrastructure as the fruit of favourable transmission cost allocation policies," said AWEA in a statement.

It also believes that utilities and grid operators should become more comfortable with wind power in 2010. "Several major wind integration studies slated for release in 2010 are expected to add further evidence that wind can be reliably integrated with the grid at low cost," said AWEA.

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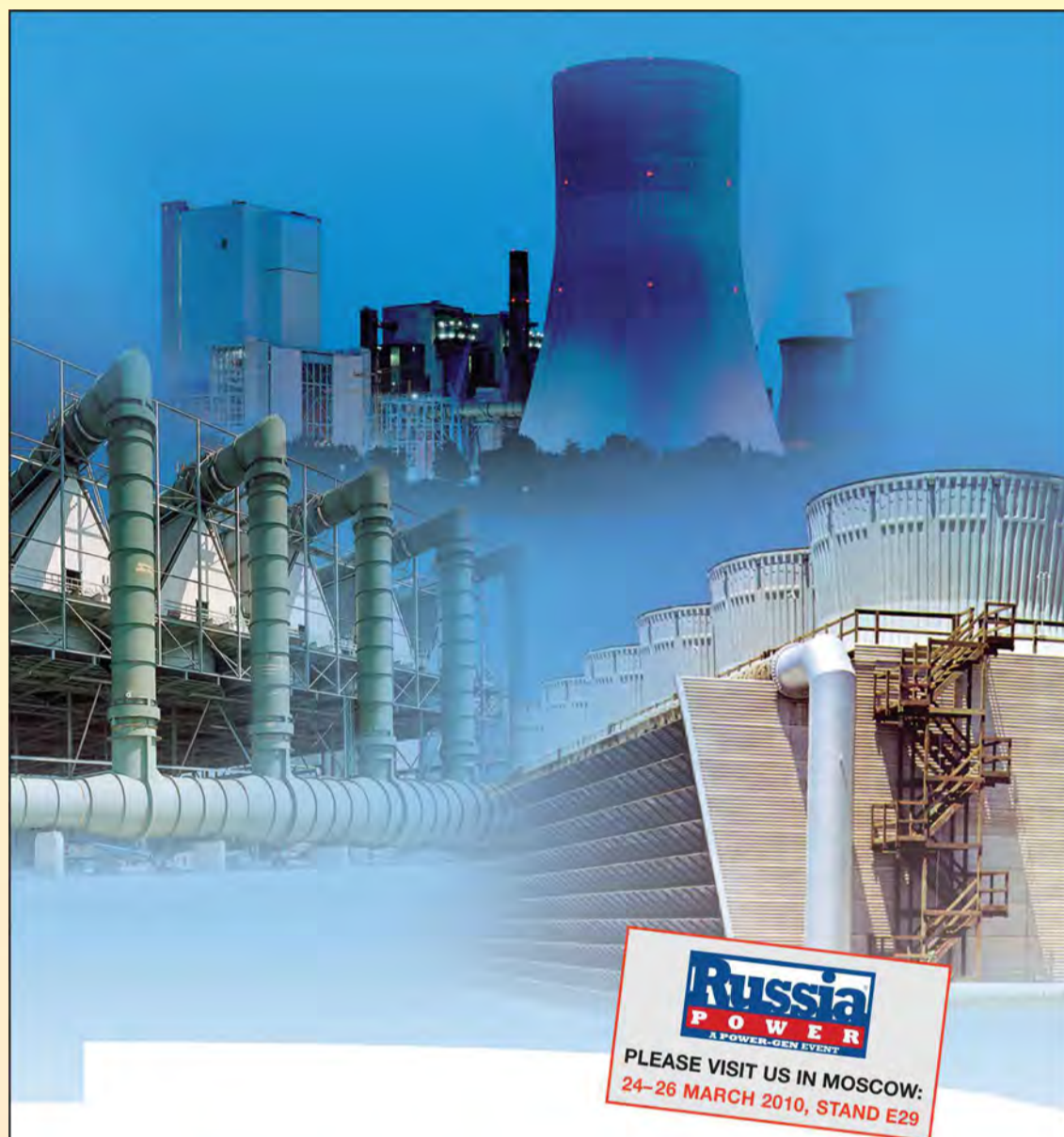
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Philippines to outline new energy roadmap

The Philippines is planning to reveal a new energy roadmap this June, writes **Syed Ali**

The Asian Development Bank (ADB) and the Philippines government are preparing a new roadmap for the local energy sector, which will take into account the substantial progress in the restructuring of the power sector. According to ADB documents, a comprehensive review is ongoing and a new sector roadmap should be ready by June this year.

The current Philippines Energy Plan (PEP), crafted in 2007, focuses on enabling the Philippines to produce 60 per cent of its energy requirements and promoting a globally competitive energy sector.

The objectives under the 2007 PEP include: accelerating the development and use of indigenous energy resources; intensifying renewable energy resource development; increasing the use of alternative fuels; and enhancing energy efficiency and conservation.

Since the 2007 PEP, a number of significant developments have been achieved by the local power sector, most notably the privatisation of more than 80 per cent of the National Power Corp.'s power generation assets.

At the same time, the renewable energy sector continues to grow following the signing of the Renewable Energy Law in December 2008.

Recently local power company Eco Enerhiya Ltd. said it plans to construct 24 renewable energy projects in the country in the next five to 10 years.

The projects, with a total capacity of 240 MW, are estimated to cost \$878.4 million. Construction of the first project, which has a capacity of 10 MW and costs \$36.6 million, is already underway in Quezon province and is expected to be commercially operational by June 2011.

Meanwhile, US-based Clenergen Corp. and state-run National Power Corp. (Napocor) is also planning to put up biomass facilities to support the off-grid operations of Napocor's Small Power Utilities Group (SPUG).

In a joint announcement, Napocor and Clenergen said they have agreed to pursue feasibility studies for Kabugao, Kalinga; Lubuagan, Apayao; Concepcion, Romblon; Corcuera, Romblon and Banton, Romblon under the first part of the programme.

Last month also saw, Icelandic geothermal development firm Envent Holding Philippines Inc. sign more than \$300 million worth of long-term supply contracts with five electric cooperatives in Leyte. The electricity will come from Envent's 50 MW Biliran Unit 1 geothermal power plant, which is scheduled to come online in 2012.

The energy roadmap is still expected to see a reliance on coal in the medium term. "In the medium term it will still be coal. Coal will still be the fuel of choice," Manila Electric Co. (Meralco) president Jose de Jesus said.

De Jesus said there have been efforts to help reduce emissions from coal plants, pointing towards technologies to capture and store CO₂ as well as coal-to-methane conversion technology.

At the end of December Global Business Power Corp. (GBPC) said it was setting aside money for the completion of its clean coal-fired power plants in Cebu and Iloilo this year. GBPC is set to invest \$600 million to finance the projects, which have a combined cost of about \$880 million.

The 246 MW Cebu project and the 164 MW Iloilo project will provide additional base load power to the Cebu-Negros-Panay (CNP) grid.

China grid investments will boost wind

China is continuing to invest in its grid to help the development of its burgeoning wind sector.

The State Grid Corporation of China said its 2009 annual grid investment might surpass market expectations and exceed 300 billion yuan (\$44 billion), and expects that the investment will keep increasing in 2010.

In 2010, investment will mainly go to urban and rural power network construction, grid upgrading, and construction of super high-voltage transmission lines.

Grid development has hampered China's wind efforts. Shi Pengfei, Deputy President of the Chinese Wind Energy Association (CWEA), estimated that China's newly-added wind power installed capacity could reach 12 000 MW in 2009, but 2010 would see a slight reduction to about 10 000 MW due to the bottleneck of domestic power grids.

According to an official with the National Energy Administration (NEA), China will become the world's third largest wind power producer this year. The country's installed wind power capacity was expected to total 20 GW in 2009, according to the New Energy and Renewable Energy Bureau of the NEA.

China saw the recent start-up of two 800 kV ultra-high voltage DC (UHVDC) lines built by ABB and Siemens Energy. Siemens and China Southern Power Grid put into operation the first pole of the Yunnan-Guangdong UHVDC link with a transmission capacity of 5000 MW. ABB meanwhile, announced the successful 'open-line' test for Pole 1 of its 800 kV UHVDC Fengxian converter station in Shanghai, in close cooperation with State Grid Corporation of China (SGCC). This link has a capacity of 6400 MW.

Asia News

US aid for Pakistan

The United States will provide \$1 billion to Pakistan for six energy sector projects over the next four years to help tackle energy shortages.

The projects include upgrading of the Jamshoro thermal power station in Sindh and the Muzaffarabad power station in Punjab province, said Richard C. Halbrook, US special representative for Pakistan and Afghanistan, after signing an agreement for the projects.

The US will also provide \$16 million to boost capacity at the Tarbela Dam hydroelectric plant. This is part of a \$125 million programme – announced in October by US Secretary of State Hillary Clinton – aimed at increasing electricity output and improving energy efficiency in the country, Halbrook added.

Meanwhile, the Sindh government is continuing its efforts to produce power from the coal reserves in the district of Badin.

In late December there was an announcement that the Sindh provincial government and Al-Abbas Group are likely to form a joint venture (JV) with an equity ratio of 40:60 between the two partners, to invest in the vast high quality coal reserves in the Badin district. They said it was likely that the JV agreement would be signed this month (February).

In addition to developing the coalfields the JV would also develop 600 to 1000 MW of coal-based generating capacity to overcome the persisting power outages in the country.

Coal group launches electricity firm

A new electricity company launched by Vietnam National Coal and Mineral Industries Group (Vinacomin) is expected to produce 20 per cent of the national electric power by 2025.

With a chartered capital of 6.8 trillion VND (\$367.2 million), the new electricity company is permitted to invest in power generators that use new and renewable energy resources, regulate electricity grids, as well as construct and operate hydro and thermal power plants.

Deputy Minister of Industry and Trade and President of Vinacomin's executive board, Le Duong Quang, said the company was founded in response to the policy of promoting multi-sector business based on the group's traditional production of coal.

The move is aimed at increasing the value of coal products exploited by Vinacomin and is expected to contribute to ensuring the national energy security, he added.

At present, Vinacomin manages and operates 23 electricity projects with a total capacity of 13 169 MW, of which two generators – the Na Duong and Cao Ngan thermal power plants – are for commercial electricity production.

S. Korea to cut emissions and reduce dependency on fuel imports

South Korea aims to have an additional 83 renewable energy power plants by 2016 in an effort to cut emissions while reducing its dependency on fossil fuel imports.

The (South) Korea Rural Community Corp. said that under a new plan announced last month, 57 small hydroelectric power stations, 20 wind power, and six solar energy plants will be constructed in the following six years. The combined annual output from these projects is expected to reach 2.22 TWh, saving Won 286.5 billion (\$251.4 million) worth of crude oil imports.

The Rural Community Corp. added that it plans to expand into the Clean Development Mechanism (CDM) business by 2016 as well, which is forecast to bring down carbon dioxide

emissions by 1.48 million tons.

In December South Korea voluntarily pledged to cut output of greenhouse gas emissions by 20 per cent from the projected emission level in 2020 compared to 2005.

Sources at the Finance and Knowledge Economy ministries said the country may introduce legislation in late 2010 to put an emissions cap on specific companies as the country moves to reduce its overall greenhouse gas output. The scheme may go into effect in stages starting in 2011. Policymakers, however, said the steel, oil refining and chemical industries may be exempted for the time being since they cannot take immediate steps to cut emissions without halting operations.

Korea's efforts to reduce emissions

received a boost with the news that the world's largest tidal power station will be built off the coast of Incheon. GS Engineering and Construction signed a memorandum of understanding with state-run Korea Hydro and Nuclear Power (KHNP) last month and will begin construction later next year with a view to completion around 2017.

The power station will have a capacity of 1.32 GW, 3.4 times greater than the capacity of the Rance Tidal Power Station in France. It will generate 2.41 TWh per year. "It will save 3.54 million barrels of imported oil annually, and provide tremendous momentum for Korea's green growth initiative," said KHNP president Kim jong-shin.

Nuclear will also play a significant

role in the country's green drive. At the end of December, a senior government official said nuclear power will help fuel South Korea's "green" economic growth and become a key export industry for the country in the 21st century.

A recent contract to supply nuclear reactors to Abu Dhabi marked the country's first nuclear export contract.



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Offshore wind growth continues apace

Europe's offshore wind industry is continuing to experience rapid growth and is even piquing the interest of private bankers. But the impact of wind energy on the grid continues to spark debate.

Siân Crampsie

The European Wind Energy Association (EWEA) has called on governments to provide an attractive investment environment for offshore wind so that the sector can reach its potential.

The EWEA has reported that the European offshore wind sector bucked the trend in 2009 with the installation of 577 MW of capacity, equivalent to a growth rate of 54 per cent over 2008. However, it notes that independent project developers are still struggling in the current economic climate.

"This is an incredibly good result considering the continued difficulties of obtaining project finance for large projects," said Christian Kjaer, EWEA Chief Executive. "For the offshore wind power industry to continue its development, it is vital that governments and the European Commission provide policy frameworks that stimulate investor interest and allow project developers to move their plans forward."

The EWEA believes that the decision

to inject €255 million from the European Union's economic recovery plan into the offshore wind sector shows that decision-makers understand the importance of offshore wind to future energy supplies. It also says that the support of the European Investment Bank (EIB) will be vital to the industry.

In 2009, the turnover of the offshore wind industry was approximately €1.5 billion, and EWEA expects this to double in 2010 to approximately €3 billion. It is also expecting ten offshore wind farms to be completed in Europe in 2010, adding in the region of 1000 MW of capacity.

The offshore wind industry is also expected to attract increasing levels of interest from the private banking sector, according to analysts Frost & Sullivan.

Interest from private banks in offshore wind is a relatively new phenomenon and can be attributed to the size, potential and opportunity that the industry presents. The recent moves made by governments and investment banks to rescue key projects last year is also a factor, says Frost & Sullivan.

In the past, very few banks were involved in this industry, as risk factors were relatively high in comparison with the more mature onshore wind sector. Inherent risks included lengthy permitting processes, the harsh offshore environments, high project costs and expensive O&M procedures.

But Frost & Sullivan says that these risks are abating as countries like the UK spearhead efforts to reduce costs related to turbine technology, installation methods and accessibility. Financial investors such as investment banks are also becoming more willing to assume major risks in order to capitalise on the opportunities that the industry presents.

Currently, 17 offshore wind farms are under construction in Europe, totalling more than 3500 MW of capacity. Just under half of this is being constructed in UK waters.

In addition, a further 52 offshore wind farms totalling more than 16 000 MW have won full consent in European waters, with just over half of this capacity planned in Germany. Several European countries are



Gordon Brown: putting new UK offshore wind at the heart of renewable energy targets

putting offshore wind at the heart of their plans to meet renewable energy targets.

In January, the UK granted the rights for the development of up to 32 GW of offshore wind in its waters. The move was hailed by Prime Minister Gordon Brown as having the potential to "make a significant and practical contribution to reducing ... CO₂ emissions", but there continues to be concerns voiced from some areas of the power industry over the impact of large levels of wind power.

French firm EDF, which is planning to build four nuclear reactors in the UK, argued recently in the *Financial Times* that nuclear power is a much more cost-effective way to cut carbon dioxide emissions than offshore wind. It believes that the expansion of the offshore wind sector will cost consumers £100 per year, compared to £40 per year for nuclear power.

The UK's energy regulator Ofgem has also expressed concerns about the country's renewed 'dash for gas' amid news that around 14 GW of new gas-fired generation has been approved

for construction. Natural gas fired plants are being built by developers to help support the proposed expansion of the wind sector as well as to help meet demand until the commissioning of the first of a new wave of nuclear plants planned for the UK.

However, natural gas supplies came under strain in the UK during the December and January cold snap and Ofgem is reportedly concerned that domestic gas production is falling and that new supplies from Russia and the Caspian region might not be available in time. The intermittent nature of wind power means that it could not be relied upon to generate electricity if gas supplies were low, particularly during cold winter weather when anti-cyclonic conditions mean that wind speeds are low.

The regulator is due to publish an energy security review this month.

Ofgem recently approved plans by the UK's electricity transmission companies to invest an additional £319 million to help connect the growing amount of renewable energy capacity to the grid.

Norway boosts CCS development

■ Trend for storage projects
■ NOK150 million awarded

Norway is planning to expand its competencies in the field of carbon capture and storage (CCS) through a new raft of grants from the country's research council.

The Research Council of Norway has awarded NOK150 million (\$25.5 million) to 20 research projects for the capture, storage and transport of

carbon dioxide (CO₂). This year has seen a considerable increase in applications for CO₂ storage projects, says the Council.

The grants are being awarded under Norway's CLIMIT programme, which aims to commercialise power generation from fossil fuels with CO₂ management through research,

development and demonstration. The programme is also backed by state-owned firm Gassnova, which manages the government's CCS programme.

Gassnova is also in charge of the construction and operation of the facilities and infrastructure for the planned CCS facilities at Kårstø and

Mongstad in Norway. In November last year it signed a memorandum of understanding with South African firm Sasol to explore the possibility of Sasol becoming a participant in the Mongstad project.

A total of 45 projects had applied for funding, according to the Research Council.

France rejects carbon tax

■ Exemptions are unfair
■ New plans likely to emerge

French President Nicolas Sarkozy's hopes for a new tax on carbon-emitting products has been dealt a blow by France's Constitutional Council.

The carbon tax was designed to encourage consumers to use less fuel and was due to take effect at the beginning of 2010. However, the Constitutional Council rejected the tax because some consumers would have been exempt.

The Constitutional Council is a body that ensures the constitutionality of French laws. It said that around 93 per cent of carbon dioxide (CO₂) emissions from industrial resources other than fuels

would not be levied under the proposed tax system.

The tax was to charge €17 per tonne of CO₂ from households and businesses and would have led to a rise in fuel prices for cars, factories and other facilities. However, some large industrial energy users such as refineries, cement producers and public transport would be exempt.

The Constitutional Council said that exempting some polluters was unfair and against the spirit of protecting the environment.

Sarkozy is reportedly keen to push forward a revised plan for the tax in the next few months.

Third nuclear unit planned for Romania

Romania's state budget law for 2010 has revealed that the country is planning to build a third nuclear power plant by 2030.

The country already has one nuclear power plant in operation – Cernavoda Units 1 and 2 – and plans for a second, two-unit plant are well advanced. The country's latest budget indicates that a third plant, with a capacity of at least 1000 MW, will be operational by 2030.

The document does not indicate a location for the third plant.

The planned second nuclear power plant is to be built at Cernavoda with participation from Enel, CEZ, GDF Suez, RWE Power, Iberdrola and ArcelorMittal Galati. It will have a capacity of around 1400 MW and will start generating electricity in 2016.

International News

Jordan endorses renewable energy law

Siân Crampsie

Renewable energy developers looking to invest in Jordan will now be able to negotiate directly with the country's Energy Ministry and bypass a competitive bidding process.

The change is one of a series of reforms being made to Jordan's renewable energy sector and is designed to expedite the development of renewable energy generating capacity.

The sweeping changes are included in the recently endorsed Renewable Energy Law, which also makes provisions for net metering and a Renewable Energy and Efficiency Fund.

Jordan's national energy strategy

calls for the Kingdom to source seven per cent of its electricity from renewable energy sources by 2015 and ten per cent by 2020.

One of the new law's main provisions is that local and international developers can negotiate directly with the government to establish renewable energy projects. Previously the process was slow and inflexible.

Renewable energy projects will have to clearly state fixed electricity tariffs in their proposals before being approved, while the National Electric Power Company (NEPCO) will be obliged to buy the output of all renewable energy plants. NEPCO will also be required to cover the cost of connecting new projects to the grid.

- Changes to speed up projects
- CTF proposal turned down

The Kingdom currently imports around 96 per cent of its energy needs at a cost equivalent to 20 per cent of its GDP. Jordan is also developing a civil nuclear energy strategy to improve energy independence.

The new law will also allow citizens with solar power or wind turbines on their property to sell electricity back to the grid at the full retail price.

It also establishes the Renewable Energy and Energy Efficiency Fund, which will support energy-saving and renewable energy initiatives and which will be supported by the state budget as well as international donor agencies.

The fund has so far received funding from the World Bank, the Global Environment Fund and the French Development Agency. International



and local private sector companies will be able to apply to the fund once the Renewable Energy Law comes into force.

Jordan's energy strategy calls for the development of 600 MW of wind capacity, up to 600 MW of solar capacity and 30-50 MW of biomass capacity by 2020.

But in spite of its ambitions, the country is reported to have recently turned down a proposal from the Clean Technology Fund (CTF) to finance a major solar energy project.

According to local reports, the government of Jordan does not want to apply to the fund for financing in light of the widening budget deficit. However the World Bank, which is one of several multi-lateral agencies

behind the CTF, says that the financing would be in the form of grants and low-rate concessional loans.

The CTF, a joint initiative of the Asian Development Bank, African Development Bank, European Bank for Reconstruction and Development, Inter-American Development Bank and the World Bank, approved \$750 million of financing in December 2009 to support the development of concentrating solar power (CSP) in Algeria, Egypt, Jordan, Morocco and Tunisia. It is also aiming to mobilize a further \$4.85 billion from other sources.

The funding would support the construction of around 1 GW of CSP capacity – in effect tripling global installed capacity.

Turkey and Russia revive nuclear project

Russia appears to have rescued a cancelled tender for the construction of Turkey's first nuclear power plant after the two countries signed a statement on the project in Moscow.

Russian firm Atomstroyexport had been named as the preferred bidder for the contract but the tender was cancelled in late 2009 after a court ruled against the tender's pricing and the location of the plant.

However Russian Deputy Prime Minister Igor Sechin and his Turkish counterpart Taner Yildiz have signed a joint statement on the development of the project and said that preparations for the signing of a formal agreement were currently underway.

The signing took place after talks in Moscow between Russian Prime Minister Vladimir Putin and his visiting Turkish counterpart Recep Erdogan.

The project will see the construction of a 4000 MW nuclear power plant near Mersin on the Mediterranean coast. Turkey will buy the electricity from the plant for a period of 15 years.

Masdar backs beam down technology

Masdar is hoping to make a "significant breakthrough" in concentrating solar power (CSP) technology by backing a new research and development project in Abu Dhabi.

The multifaceted renewable energy initiative is joining forces with the Masdar Institute of Science and Technology (MIST), Japan's Cosmo Oil Company and the Tokyo Institute of Technology to develop an advanced, innovative 'beam down' CSP system. The companies say that the technology has the potential to convert solar irradiation into electricity more efficiently than other technologies.

The announcement from Masdar came alongside several other key developments at the World Future Energy Summit in Abu Dhabi last month, where the head of the newly created International Renewable Energy Agency (IRENA) called on all countries to do more to develop renewable energies and reduce carbon emissions.

Hélène Pelosse, Interim Director-General of IRENA said that all countries should share the responsibility of reducing carbon emissions and that oil-producing nations should develop renewables without waiting for fossil fuel reserves to dry up.

Her comments came after Qatar's Minister of Energy and Industry said that developed countries should set their own carbon emission reduction targets rather than force other countries to abide by them.

The beam-down technology that Masdar wants to develop inverts conventional tower CSP technologies, where the sun's rays are directed by mirrors onto a receiver at the top of a central tower. By placing the receiver at ground level, the research team believes that it can reduce energy losses resulting from pumping the fluid to an elevated receiver, raising operational efficiency and lowering electricity generation costs.

The research agreement is the most recent component of an ongoing effort by the UAE to position itself as a global leader in renewable energy, which began with the establishment of the Masdar Initiative in 2006. Earlier last year, the

leadership of Abu Dhabi committed itself to a seven per cent renewable energy target by the year 2020 and Abu Dhabi was selected to host the headquarters of the IRENA in Masdar City.

"Our strategic partnership with Cosmo Oil and the Tokyo Institute of Technology enables us to explore innovative procedures for improving the efficiency of solar thermal energy production," said Dr. Sultan Al Jaber, Chief Executive of Masdar. "The initial project findings have been very positive and if the results continue to be successful, beam down technology has the potential to revolutionise the way in which all solar towers are built in the future."



Tokyo Institute of Technology: working in partnership with Masdar

Ethiopian dams boost capacity

The official inauguration of Ethiopia's Gilgel Gibe II hydropower project has increased the country's generating capacity by 30 per cent.

The 420 MW plant is one of two major power projects completed in the country in the last few months. A third project, the Beles hydropower plant, is scheduled to start operating in early 2010.

Gilgel Gibe II is the largest power plant ever to be built in Ethiopia and was developed by Italian firm Salini Costruttori on an EPC basis. It consists of a 50 m high gravity dam with a crest length of 140 m.

Construction of the €373 million plant was delayed due to difficulties in the construction of a 26 km tunnel that crosses the ridge between the Gilgel Gibe valley and the Omo valley to create a 505 m head.

The project was funded by a €20 million soft loan from Italy with the balance covered by the European Investment Bank and the Ethiopian government.

Beles is a 460 MW project that is also being developed by Salini Costruttori. It is located on the shores of Lake Tana, 360 km north of Addis Ababa.

Afghan efforts "disappointing"

A US watchdog set up to oversee reconstruction efforts in Afghanistan says that an updated master plan is needed for the country's energy sector and that security concerns and sustainability issues are hampering investments.

The Special Inspector General for Afghanistan Reconstruction (SIGAR) says that the USA has spent over \$732 million on Afghanistan's energy sector since 2002. But while electricity generating capacity has doubled, some 85 per cent of urban households remain

without electricity.

In a January report, SIGAR found that Afghanistan's ambitious goals for the energy sector are unlikely to be met. Specific problems include an inability to collect revenue, difficulties recruiting and retaining qualified staff,

security issues and poor oversight by US agencies.

"Several key USAID-funded projects have faced delays and increased costs due, in part, to a general lack of quality assurance oversight and security concerns," reads the report. "USAID

has established a goal of providing reliable and affordable electricity by increasing operational capacity to 1000 MW by 2012, but has not set timeframes and goals in other areas, including capacity building and operations and maintenance."

Masdar, E.On shoot for CDM projects

■ Opportunities in fuel switching and flare gas projects

■ Torresol secures loan

Siân Crampsie

Abu Dhabi's Masdar and German firm E.On are broadening their business relationship through a new joint venture that will develop carbon emission reduction projects around the world.

The two companies are already partners in the massive London Array offshore wind farm but are now aiming to capitalise on opportunities in the carbon credit market through E.On Masdar Integrated Carbon (EMIC).

EMIC's focus will be on the development of projects in the Middle

East, Africa and Asia that improve the energy efficiency of industrial facilities such as power generation plants and oil and gas facilities. The emission reductions achieved will be monetized in the form of carbon credits and traded under the United Nations' Clean Development Mechanism, say the companies.

"This initiative builds on our already established successful relationship with E.On and our matching vision about the carbon market and the choice of technology," said Masdar Chief Executive Officer Dr. Sultan Ahmed Al Jaber. "It is a good opportunity to leverage our

competitive advantage to create value on the global market."

EMIC will be one of the leading companies in the full value chain management of a carbon abatement projects and achieve its ambitions using in-house resources. News of the partnership was announced at the World Future Energy Summit (WFES) in Abu Dhabi last month, where Masdar also made several other key announcements.

E.On and Masdar say that EMIC will focus on projects and technologies with large carbon abatement reduction potential such as fuel switching, open cycle to combined cycle gas turbine



Dr. Sultan Ahmed Al Jaber: building on relationships

conversion, gas pipeline leakage reduction and flare gas reduction.

At the WFES, Masdar also said that another of its key international partnerships, Torresol Energy, had achieved a milestone by securing a \$760 million loan for two concentrating solar power (CSP) projects in Spain.

Torresol Energy is Masdar's joint venture with Spanish firm Sener and is building twin advanced CSP plants in Andalusia at a cost of \$1 billion. The two 50 MW plants will incorporate the use of molten salt thermal storage technology and are a key part of Torresol's plans to build 320 MW of CSP capacity by 2013.

Geothermal group seals deal

■ Reykjavik Geothermal plans Masdar headquarters

■ Focus on east Africa and emerging markets

Reykjavik Geothermal is hoping that a partnership with Ambata Capital Partners will bring it a step closer to its ambition to become a leading player in the geothermal power market.

The two companies have signed an agreement to explore, develop and operate utility-scale geothermal power plants in emerging markets.

Reykjavik Geothermal has also

announced that it is planning to establish a headquarters in Abu Dhabi's Masdar City.

"Geothermal is becoming an increasingly important part of the renewable energy mix worldwide," said Gudmundur Thoroddsson, Founder and CEO of Reykjavik Geothermal. "This is particularly true in emerging nations, many of which possess the best quality

geothermal resources and have very attractive market dynamics."

Founded in 2008, Reykjavik Geothermal says that the majority of the world's geothermal resources remain untapped and is already exploring opportunities in Iceland, Russia, Rwanda and Kenya. It is also pioneering the first geothermal developments in India and the

Arabian Gulf.

"Our partnership with Ambata will be highly accretive as we execute on our plans," added Thoroddsson. "With their deep experience in our target markets – particularly the Middle East and Africa – combined with their sector expertise and capital raising abilities, Ambata is uniquely qualified to accelerate our strategic plans globally."

Enel buys US wind project pipeline

■ 4000 MW in development in California

■ NRG and Enel to cooperate in renewables

Enel has significantly expanded its renewable energy portfolio with the purchase of Padoma Wind Power, the terrestrial wind development arm of US utility NRG Energy.

In a deal signed by NRG and Enel North America, a subsidiary of Enel Green Power, Enel will retain Padoma's development team and the company's development pipeline in California and Texas. NRG and Enel North America will also work together to evaluate joint venture opportunities in the US renewable energy market.

The terms of the deal were not disclosed.

NRG will retain its existing ownership interest in three Texas wind farms – Sherbino, Elbow Creek and Langford – totalling almost 350 MW of capacity. It will also retain a right of first offer for the Padoma projects should Enel seek a partner.

Padoma is developing around 4000 MW of potential projects in California that will help the state meet its obligations under the Renewable Portfolio Standard.

"Padoma's current pipeline in California and the experience of its development team will further strengthen our position in the United States and provide us with solid opportunities to grow in attractive markets in the future," said Francesco Starace, President of Enel Green Power. "Padoma adds depth to our North American development capabilities and provides key geographical diversification to our wind pipeline."

"Enel's experience and resources will enable Padoma to realise the full

benefits of its development potential, increasing the pipeline of renewable investment opportunities for NRG's consideration," said David Crane, President and CEO, NRG Energy, Inc. "Padoma had considerable success developing terrestrial wind projects under NRG's ownership and we look forward to working with Padoma and Enel and investing in their projects in the future."

Enel Green Power has a worldwide installed capacity of 4700 MW, 700 MW of which is in the USA.

GDF Suez and IP abandon talks

GDF Suez's ambitions to expand its power portfolio through an industrial agreement with International Power have been dashed after talks between the two companies ended.

France-based GDF Suez and International Power of the UK had apparently been in talks over some form of cooperation for months. Their discussions are thought to have focused on the creation of a partnership involving their foreign

energy assets.

The two companies have complementary portfolios and a tie-up with International Power would have strengthened GDF Suez's presence in the UK and the Middle East. Other potential synergies include GDF Suez's presence in North America's liquefied natural gas (LNG) market and International Power's large generating portfolio there.

The combination of their international assets would have led to the creation of a major power producer with an installed capacity of around 73 GW; GDF Suez would have held a majority stake in the venture.

The deal could have entailed asset swaps or share sales. The two firms confirmed in January that no agreement was reached and that discussions were no longer ongoing.

International Power is one of the world's largest independent power generators, with a gross generating capacity of just over 32 GW in Europe, Australia, North America, the Middle East and Asia.

GDF Suez has over 68 GW of installed generating capacity and is the world's tenth largest electricity producer. It is aiming to grow its generating capacity to 100 GW by 2013.

REpower strategy to boost sales

Wind turbine firm REpower is hoping to boost sales through an agreement with parent company Suzlon Energy.

The Germany-based firm says that the agreement will enable it to take advantage of the growth seen in many renewable energy markets around the world, and where Suzlon has a strong presence.

Under its deal with Suzlon, Suzlon's local subsidiaries in countries such as the USA, Australia and New Zealand will help REpower to expand its market presence and promote sales. REpower will retain its responsibilities for project management, service, and technical support for all REpower turbines sold within those markets.

"We have great confidence in Suzlon's sales capabilities and are happy that they have taken REpower's agency, as this allows us to bank on their vast experience in the US and Australian markets," said REpower CEO Per Hornung Pedersen. "Given the projected increase in demand in the short to mid-term in these key markets, our agreement comes at the right time."

Australia and the USA are key growth markets for wind energy. REpower says it will benefit from Suzlon's market knowledge and customer networks.

REpower generated a total performance figure of €32.1 million in the first nine months of fiscal 2010, up from €842.9 million in the corresponding period of the previous year. Sales also grew over fiscal 2009, from €850.5 million to €20.5 million.

Tenders, Bids & Contracts

Americas

Basin chooses Ovation controls

Emerson Process Management has signed a deal with Basin Electric Power Cooperative to install its PlantWeb digital plant architecture with the Ovation expert control system at a new 300 MW combined cycle plant in South Dakota.

The Deer Creek power plant is being built to help Basin Electric meet its members' growing demand for power. The plant will serve as an intermediate supply unit running for approximately 12-16 hours a day, cycling to meet demand, and is expected to be operational in June 2012.

In addition to monitoring and controlling the heat recovery steam generator (HRSG) and balance of plant processes, the Ovation control system will also interface to the plant's GE gas turbine and Alstom steam turbine. It will manage approximately 2500 process variable points at Deer Creek.

Wood Group wins US O&M contract

Wood Group GTS has secured a five-year contract to operate and maintain the Rumford and Tiverton power plants in Maine and Rhode Island, USA.

Owned by Brick Power Holdings, the Rumford and Tiverton gas fired combined cycle power facilities have 265 MW of generation capacity. Both plants consist of General Electric Frame 7FA heavy industrial gas turbines.

The operations and maintenance contract is valued at \$27 million and includes complete care, custody, control and maintenance of both facilities, from the mobilisation/transition stage, which began in October 2009, through to the operational phase in 2010.

Vestas to equip Kent Hills

Danish wind turbine manufacturer Vestas has won a contract to supply an additional 18 wind turbine units to the Kent Hills wind farm in Canada's New Brunswick province.

The Kent Hills site already has 32 of Vestas' V90-3.0 MW wind turbine models in operation and the addition of more units will boost its output to 150 MW. The order was placed by Canadian wind power plant developer and operator TransAlta Wind.

The order includes a five-year service and maintenance contract.

Asia Pacific

Northwest opens bids

Bangladesh's Northwest Power Generation Company has opened and read out the financial offers received for the construction of two power plants.

China's Shanghai Electric Co made the lowest read out bid for the 150 MW Khulna peaking power project, while Spanish firm Cobra made the lowest bid for the 150 MW Sirajganj power plant.

Northwest will now evaluate the bids in more detail before confirming the actual lowest bidder in each case.

Cobra bid \$102 million for the Sirajganj project. Chinese company Shan Dong and CMEC had also bid for the project. For the Khulna project, Shanghai Electric's read out offer was around \$100 million. Cobra, Shan Dong and Spanish company Isolax had also placed bids for the project.

The two projects are backed by the

Asian Development Bank. Northwest floated tenders for these dual-fuel peaking power projects in early 2009.

Emerson to automate new Indian plant

Emerson Process Management has been selected to automate a new 810 MW captive power plant in the eastern Indian state of Orissa.

The new plant is owned by Jindal Steel & Power Ltd (JSPL) and will consist of six 135 MW coal-fired units located at a site in Angul. It will supply energy to JSPL's 6 million tons per annum integrated steel plant and will eventually be expanded to 2500 MW.

Under the contract, Emerson will install its PlantWeb digital plant architecture with the Ovation expert control system and AMS Suite: Intelligent Device Manager at the plant. It will also supply its Scenario high-fidelity simulation technology, and will execute the project through its Indian operations.

Emerson's PlantWeb digital architecture with the Ovation system will monitor and control each unit's boiler and balance-of-plant processes, as well as common auxiliaries such as the coal handling plant, ash handling plant, de-mineralization water plant and cooling water system. The Ovation system will also interface to each unit's steam turbine, and all six units – as well as common auxiliary controls – will be integrated through Ovation's multi-network technology.

In addition, Emerson will supply six of its Rosemount steam and water analysis systems (SWAS) for the new units, as well as an Uninterrupted Power Supply system (UPS).

GE supports Chinese wind sector

GE has signed contracts to supply 88 wind turbines to HECIC New Energy Co., Ltd, one of China's leading wind energy developers, for three new projects in Hebei and Shanxi Provinces.

The new wind farms will add 132 MW of installed wind power capacity in China, which currently ranks fourth behind the USA, Germany and Spain in wind power production. According to the Global Wind Energy Council, China continued its rapid growth in wind energy in 2008 by doubling its installed capacity to 12.2 GW.

GE has already committed to supply 895 of its 1.5 MW wind turbine units to China, which is planning to add 150 GW of wind power capacity by 2020.

"The development of wind power is a key economic growth area for China and plays a critical role in achieving our national target to increase to 150 GW of installed wind energy capacity by 2020," said Dr. Cao Xin, General Manager of HECIC New Energy Co., Ltd.

Doosan to build 1370 MW Raipur plant

Doosan Heavy Industries & Construction Co. has won a \$1.09 billion contract from GMR Energy to build a 1370 MW coal-fired power plant in Raipur, Chhattisgarh in India. It is the company's largest overseas order since May 2007.

Construction of the plant is due to be completed in the second half of 2013 and will contribute to India's plans to add 160 GW of coal-powered plants over the next 10 years as economic growth spurs demand.

In a separate regulatory filing, Doosan Heavy said it will provide equipment worth 859 billion won

(\$766 million) to its Indian unit, Doosan Projects India PVT, for the project.

Metso to build biomass plant

4HamCogen SA, a subsidiary of 4Energy Invest SA, has placed an order with Metso for a biomass-fired combined heat and power plant in Ham, Belgium.

The power plant will be delivered by MW Power, a joint venture set up by Metso and Wärtsilä to capitalize on opportunities in Europe's growing biomass power market. Metso's automation business will deliver the plant's automation system.

The new plant will be based on bubbling fluidized bed (BFB) technology and will use non-contaminated biomass as the main fuel. It will generate 8.4 MW of electricity and 14 MW of heat.

Europe

Sunday Energy wins 5 MW deal

Solar energy systems integrator Sunday Energy Ltd has won a deal to build a 5 MW photovoltaic (PV) solar array in the Negev, southern Israel.

Under a deal with Moshav Yad Natan, Sunday Energy will build the array on a 17 hectare site in an abandoned quarry at an estimated cost of NIS100 million (\$26.8 million). The contract follows a similar deal signed earlier in January to build a 5 MW PV facility at Kibbutz Zeelim in the Negev.

International

KenGen orders Wärtsilä plant

The Kenya Electricity Generating Company (KenGen) has placed an order with Wärtsilä for a 117 MW emergency power plant.

The Finnish engine manufacturer is to build the Kipevu III thermal power plant on a turnkey basis in Mombasa, Kenya's second largest city. The plant will supply electricity to the national grid and will play a key role in reducing energy shortages in the country.

Wärtsilä will supply seven of its 18V46 engines, initially to be run on heavy fuel oil, to provide the generating capacity for flexible baseload supply. The delivery also includes a gas insulated switchgear substation for connection to the existing grid.

The plant will start operations in January 2011.

GE wins Cernavoda NPP contract

US firm GE is to service and maintain the Cernavoda nuclear power plant in Romania for eight years under an agreement signed in January.

GE and Nuclearelectrica, Romania's state-owned nuclear power company, have signed the agreement, which is valued at up to \$146 million and covers full maintenance and repair services for the GE steam turbine-generators and auxiliary equipment at Cernavoda Units 1 and 2.

Cernavoda supplies 20 per cent of Romania's energy, according to the Romanian Energy Regulatory Authority. The new agreement supports Nuclearelectrica's goals to produce reliable, safe and efficient energy, a key part of Romania's national strategy for social and economic development.

Pompiliu Budulan, general director of Nuclearelectrica said: "As

Romania's only nuclear power plant, Cernavoda plays a critical role in meeting our growing energy requirements."

GE's agreement replaces and expands upon a previous four-year contract with Nuclearelectrica for Unit 1 that recently expired.

Cernavoda produces more than 1400 MW of power for Romania's electricity grid. Unit 1 has been in operation since 1996, while Unit 2 was commissioned in 2007.

ABB to build Jazan substation

Technology firm ABB has won an order worth SR79 million (\$21.14 million) from South Steel Company (SOLB) to design, supply and install a 132 kV substation in Saudi Arabia's Jazan Economic City.

The substation will power the South Steel Company, the first steel plant to be situated in southwest of Jazan Economic City. The contract was signed with South Steel Company's majority investor Pan Kingdom Investment and will ensure that SOLB can meet its annual production capacity of one million ton billets and rebar.

Jazan Economic City is one of Saudi Arabia's new economic zones and will focus on heavy and secondary industries. The substation is expected to be completed by 2011.

Paz Oil builds PV plants

Paz Oil subsidiary Paz Solar Ltd is to build three mid-sized photovoltaic (PV) power plants in Israel at an estimated cost of NIS240 million (\$64.4 million).

According to Paz, two of the plants will be built at Kibbutz Hazerim and Kibbutz Ein Hashlosha in the Negev, and one will be built at a site in Galilee. It has signed contracts for all three sites and has given the landowners the option of becoming partners in the projects.

Paz will design and build the PV plants and operate them for 20 years. The two plants in the Negev will both have a capacity of 5 MW, with the arrays built on 9-hectare sites at a cost of NIS90 million each.

The Galilee power plant will have a capacity of 3.5 MW and will be built on a 6-hectare site at a cost of NIS60 million.

Paz says that it is aiming to bring the power plants on-line within 12 months.

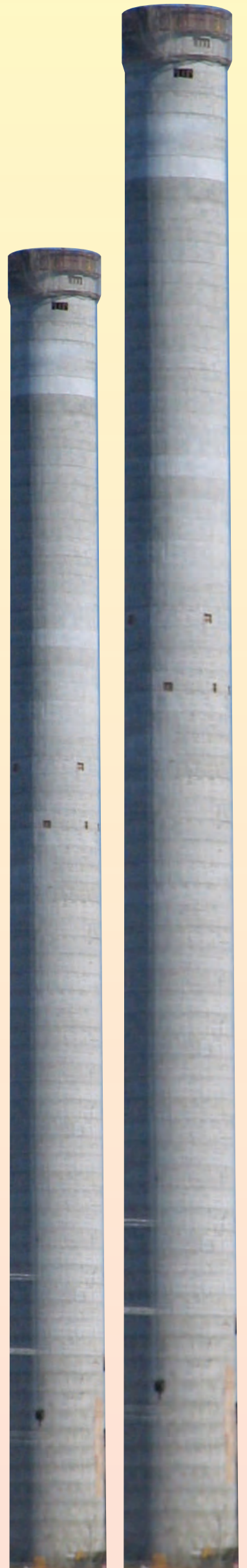
Wärtsilä boosts Turkish presence

Finland's Wärtsilä signed several agreements at the end of December 2009 to supply equipment for gas-fired power plants under construction in Turkey.

The company is to supply four separate power plant projects, and has signed maintenance agreements for two of the installations. All of the projects are scheduled to start operation in 2010.

Wärtsilä signed contracts to supply the equipment for an extension to the Rasa Enerji power plant in Van, in the east of Turkey, and for the Naksan power plant project in Gaziantep, located close to the Syrian border in the southeast of Turkey. A third installation is for the Marmara Pamuklu power station in Corlu, close to Tekirdag, which is located in the northwest of Turkey.

Most recently, Wärtsilä has been contracted to supply equipment for the H.G. Enerji power plant project in Gediz, in the province of Kutahya in the Aegean region of the country.



Europe tackles renewables integration

The increasing share of renewables in the generation mix is putting immense pressure on Europe's grid and in some instances even restricting the connection of renewables. Various legislations and directives are being enacted to improve Europe's grid and grant priority access to renewables and other forms of distributed generation.

Malavika Tohani

Europe's transmission and distribution grid infrastructure is more than 40-50 years old and was designed to mainly accommodate large, conventional base load power generation such as coal-fired, natural gas and nuclear power plants.

Today's power generation landscape, however, looks much different with renewable and distributed generation occupying an increasing share of the generation mix. The European Commission's 20-20-20 directive of generating 20 per cent energy from renewable sources by 2020 implies that renewables would have to contribute to 34 per cent of electricity generation in 2020.

This is putting immense pressure on the existing grid and in some instances even restricting the connection of renewables to the grid.

A good example is Spain, where system integrators are unwillingly restricting the connection of wind farms to the network in some parts, due to the inability of the grid to support greater renewable energy penetration.

The future will also see electric vehicles (EVs) and energy storage becoming a part of the electricity infrastructure, thus requiring existing grids to accommodate all forms of generation. Moreover, with Europe moving towards a single grid due to liberalisation and EU expansion, efforts to increase efficiency and coordination of generation and consumption needs to be on a pan-European level, without neglecting the interests of regional transmission system operators (TSOs) and distribution system operators (DSOs).

In December 2008, the European Network of Transmission System Operators for Electricity (ENTSO-E) was created, which integrated the operations of the five different Transmission System Operators (TSOs) across Europe into one entity. This organisation is expected to quicken the pace of decision making in order to guarantee grid upgrades and increase the share of renewable generation in distributed networks.

In fact in December 2009 ENTSO-E, as required by the Third Energy Package, launched a R&D plan to overcome the challenges and prepare for the electricity markets in 2020 and beyond. Similarly, the Renewables-Grid-Initiative (RGI) launched in 2009 is an effort by non-governmental organisations (NGOs) and TSOs to speed up investment in grid infrastructure and integrate renewables into the network.

Various legislations and directives have also been enacted to ensure grid improvements and grant priority access to renewables and other forms of distributed generation to the transmission and distribution network. For example, the EU Electricity Directive states that DSOs must give priority to renewable generators, energy from waste plants and combined heat and power (CHP) schemes while dispatching generation. Similarly, the Security of Electricity Supply and Infrastructure directive specifies that EU member states must invest in secure T&D networks and that TSOs must provide regular investment plans for cross border interconnectors to its national regulators.

However, some key challenges exist

with respect to cost sharing, delays in the planning process, movement towards smart grids, the intermittent nature of renewables and technical issues such as measurement and control, monitoring and safety.

The first and foremost challenge that needs to be addressed is with respect to who should bear the cost of connection to the grid, renovations or extensions and reinforcements.

Countries within Europe follow different charging methodologies. For instance, Denmark, Belgium and Germany among others, follow 'shallow' connection charges, wherein the generator only pays for the cost of physical connection to the grid, while reinforcements, etc are borne by the distribution network operators and these charges are passed on to the final consumer by including them in system charges.

On the other hand, in countries like Spain, Greece and Sweden, the generator not only pays for the connection to the grid but also for any upstream reinforcement costs. This is known as 'deep' connection charges. This of course places a higher burden of costs on the producer and hence discourages electricity production from renewable sources.

There is also a third form of charging which combines the features of the shallow and deep charges called 'shallowish' connection charges, which is followed in the UK. In this model the generator pays for a part of the reinforcement costs depending on the proportion of increased capacity required.

Given that Germany and Denmark have a high percentage (14 per cent and 30 per cent, respectively) of electricity being contributed by renewables, it is clear that the 'shallow' connection charge is an encouraging model to follow. Shallow connection charges drive renewable projects in areas that offer the best prospect for wind or solar growth rather than

In 2009, ENTSO-E launched a 'pilot code project' for wind generation with the aim of harmonising grid codes for wind generators across Europe

depending on grid availability or quality. However, it could become an expensive proposition if grid extensions are required from the best locations. This is an increasing possibility with the growing share of offshore wind, wave, geothermal, etc., and the gap between consumption and generation widens in terms of location.

The decision on the best charging system to follow depends on a variety of factors such as amount of renewable power to be connected, grid availability and network quality, among others.

'Deep' connection charges are deemed to be unpromising at the onset as it places the entire cost burden on the producer. Hence, the first step for countries following this model is to move to either a shallow or shallowish charging policy. The choice between a shallow or shallowish charging policy then should be made on the amount of power being connected to the network and existing network capacity. If a large scale connection is required that involves substantial reinforcements and grid extensions, then a shallowish connection policy is better suited than a shallow one. It is important that



Malavika Tohani: a lack of standardisation has led to increased costs as well as inefficiencies for all stakeholders

countries clearly specify the power limit differentiating small scale and large scale connections. It is difficult to standardise these capacities across Europe due to the variations in network quality.

Renewable energy generation being quite different to conventional power generation brings with it, its own set of technical challenges such as voltage fluctuations, harmonics and fault management and control. Adherence to grid codes, which specify the technical requirements for wind power plants, is also a major challenge.

The move towards smart grids incorporating digital communication technology to deliver efficient, economic and secure electricity is expected to solve many of the technical issues. R&D to find advanced

consistent and uniform across Europe.

In 2009, ENTSO-E launched a 'pilot code project' for wind generation with the aim of harmonising grid codes for wind generators across Europe. This is expected to benefit all parties involved since equipment manufacturers can develop common hardware and software platforms while wind farm developers would enjoy lower connection costs and wind turbine costs.

Efforts are also ongoing to reduce bureaucracy and red-tape in granting planning permits and permission for renewable energy projects, in order to help countries achieve their 20-20-20 targets. This problem is particularly acute in Italy and the UK.

In 2009, the UK streamlined the approval process for large energy projects in order to fast-track decision-making and avoid long delays. However, this is only applicable to projects above 50 MW, and given that the majority of solar and onshore wind farms are below this capacity, real benefits accrued are expected to be limited. The need of the hour is to enforce and adhere to set deadlines, increase manpower to deal with the volume of projects and appoint a central body rather than having to deal with local authorities or various departments.

It is apparent that the future is only going to witness an increasing share of renewable energy generation coupled with the efforts to make the grid intelligent by incorporating digital communication technology. Although challenges exist, efforts are being made by governments, renewable energy associations, utilities, network operators and so on, to increase transparency, reduce inefficiencies and standardise protocols thus benefiting generators, distributors and ultimately the end customer.

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technologies and equipment as well as the use of intelligent equipment such as superconducting cables, phasor measurement units, high voltage DC and AC cables, smart meters, Scada and distributed management systems, flexible AC transmission systems (FACTS) and so on, are expected to address the technical issues in an efficient and cost effective manner. Installation of smart meters is the first step towards smart grids. Italy has been the most proactive with over 33 million smart meters installed to-date, followed by Sweden. Other countries are following suit, with the most recent one being the UK to announce smart meter deployment in every household by 2020.

As mentioned previously, grid codes differ from country to country and the lack of standardisation has led to increased costs as well as inefficiencies for all stakeholders involved with wind generation. With the proportion of wind in the total electricity generation mix expected to increase in the future (4.2 per cent in 2008 to 14-17 per cent in 2020 and around 26 per cent in 2030), it is crucial that grid codes are

Oil

Crude prices steady but volatility expected to remain

■ “Up-tick” in upstream investment now necessary
 ■ Prices likely to be vulnerable in second quarter

David Gregory

Crude oil prices started the year on a high note with West Texas Intermediate (WTI) closing at \$81.51/b on January 4. WTI has since fallen to around \$76/b but remains in a range that keeps Opec members comfortable.

Speaking in Riyadh on January 17, Saudi Arabia's Deputy Oil Minister, Prince Abdulaziz bin Salman, said oil prices are “reasonable” within the \$70-80/b range. “Everyone is aware that the price agreed by both consumers and producers should be a price that encourages producers to continue production and expand capacity and this is also an adequate price for consumers,” he said.

The fact that prices were moving in the \$70-80/b range in December, when Opec held its last conference in Luanda, prompted the group to reaffirm its production target of 24.845 million b/d. While the next Opec conference will not take place until March, the members can be expected

to roll their quotas over again, provided prices stay within that range and global economic improvements continue.

“Opec will not do anything that might have a negative impact on the global economy,” Prince Abdulaziz said.

Despite an effort at the start of the year to reduce crude oil supplies to the world market with drastic reduction cuts, ample supplies remain available. And despite this, prices have risen, showing that fundamentals are having little influence on the market. Rather, crude oil is being treated increasingly as a commodity, making it increasingly volatile.

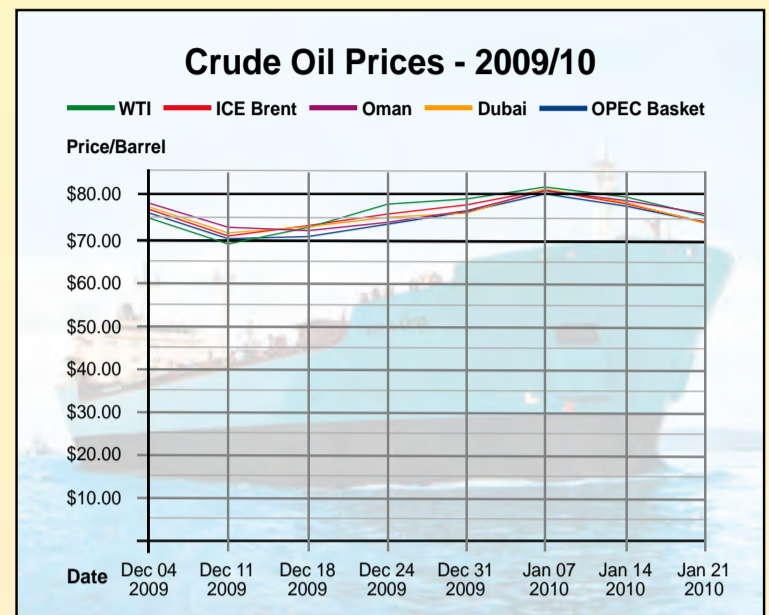
Crude oil prices were in the \$40/b range at the start of 2009, but by the end of the year they had doubled. This has encouraged producers to exceed their quotas, but should prices begin to slip in the weeks ahead, strict compliance with production targets will very likely become an issue at Opec's March meeting.

Regardless of the current state of

global oil prices, oil producers are being urged to proceed with capacity expansion projects in order to cope with an anticipated return of demand once the global economic recession comes to an end.

Fatih Birol, Chief Economist at the Paris-based International Energy Agency (IEA) has asked oil and gas producers to invest in upstream projects despite the uncertainties of the current economic malaise. Speaking in Riyadh in mid-January, Dr. Birol said an “up-tick” in upstream investment is necessary now in order to meet energy demand in the future.

Fossil fuels will account for 77 per cent of the increase in world energy demand between 2007-2030, Dr. Birol told the International Energy Forum, adding that global oil demand is forecast to rise from 85 million b/d in 2008 to 88 million b/d in 2015 and 105 million b/d in 2030. By comparison, investment in upstream projects had fallen by 19 per cent during 2009, he said, more than \$90



billion. If crude remains in the \$70-80/b range, oil producing countries are seen as having adequate earnings to proceed with capacity expansion projects.

For the time being, demand is not expected to make any sudden jumps. In the latest edition of its *Oil Market Report*, released on January 15, the IEA made little adjustment in its forecast for future oil demand, putting 2010 demand at 86.3 million b/d. This year, Opec is expected to supply an average of 29.1 million b/d, while total non-Opec supply will average 51.5 million b/d.

Growth in demand is driven by the non-OECD countries, most notably in Asia, the IEA report said, adding that oil demand recovery in the OECD countries will likely remain sluggish, despite the recent cold weather.

In its own *Monthly Oil Market Report*, Opec estimated global demand for its crude in 2010 to average 28.6 million b/d. The report, released on January 19, estimated world oil demand for 2010 at 85.15 million b/d, and total non-Opec crude supply to average 56.56 million b/d.

The Opec report warned that in the coming months, the direction of the oil market will depend on the continuation of the current relatively positive outlook for the global economy, especially in key countries such as the US and China. “Should developments turn out to be less positive than expected, market attention will revert back to weak oil fundamentals,” the report said, adding: “Prices are likely to be particularly vulnerable to economic developments during the upcoming low-demand second quarter.”

The Opec report went on to say that although the overall situation is much improved compared to the same time last year, given the uncertainties surrounding the strength and durability of the economic recovery and weaker seasonal demand, the Opec Conference decided to keep current oil production levels unchanged for the time being. “The persisting stock overhang, low seasonal demand and start of refining maintenance point to the need for continued caution over the coming months as market volatility is expected to remain.”

Gas

EU energy nominee calls for solidarity on gas

Incoming EU Energy Commissioner says bilateral contracts between individual EU members and a third country should be replaced with a European treaty to secure supplies.

Mark Goetz

Gunther Oettinger, Germany's nominee for the post of Energy Commissioner for the European Union, called for solidarity among EU members on all future gas import agreements during his confirmation hearing in Brussels on January 14 and voiced his support for the proposed Nabucco gas pipeline. Mr. Oettinger, along with other nominated commissioners, is due to assume duties in February for a five-year period.

Mr. Oettinger, who is the state premier of Baden-Wuerttemberg, called for a “massive paradigm shift” in EU energy policy that includes the

“Europeanisation” of energy deals.

As an example he cited the Nord Stream gas pipeline project between Russia and Germany, which bypasses the Baltic states and Poland by following a course through the Baltic Sea. Mr. Oettinger said he agreed that the Nord Stream project had been planned “without a spirit of solidarity.” But while he voiced opposition to the manner in which the Nord Stream agreement was reached, he said delaying or stopping it would be incorrect.

Poland and the Baltic states, which are EU members, have criticized Nord Stream as a political act by Russia designed to prevent them from gaining

access to a Russian gas pipeline system built to supply the EU.

Mr. Oettinger said bilateral contracts between an EU member and a third country should be replaced with a European treaty to secure supplies. “I am prepared to work on binding measures on solidarity and to ensure we all speak with one voice on energy,” he said, adding: “This needs to be shored up with binding legislation.”

He said the EU should move away from bilateral energy agreements to a European approach, adding that it should be the EU that is in charge of negotiating with outside suppliers in order to ensure that EU members do

not wind up working against one another.

The EU's new Lisbon Treaty, which came into effect on December 1, 2009, contains an article on energy solidarity. During his hearing, Mr. Oettinger said every EU member “has to be guided by this, so nations won't be able to garner an advantage for themselves anymore.” He also called for energy links to be made between EU members so that no country is left out.

The Nord Stream gas project involves the construction of a dual underwater gas pipeline running through the Baltic Sea from Russia to Germany. When complete in 2012, the 1200 km pipeline will have the capacity to transport 55 billion m³ of natural gas to northern Germany. Former German Chancellor Gerhard Schroeder strongly supported the project and when he left office in 2005, Russia offered him the position of chairman of the board of Nord Stream AG.

Mr. Oettinger proposed that EU members take steps to assist one another during periods of supply disruptions, as was the case in January 2009, when Russia halted gas

shipments through Ukraine because of a price dispute with Kiev. That disruption affected 20 EU countries.

He also urged the EU to continue its support of the Nabucco Gas Pipeline project, which proposes to carry natural gas from the Caspian Sea region and the Middle East to Southeast and Central Europe through a 3300 km pipeline via Turkey. The pipeline, designed with a 31 billion m³/year capacity, has experienced problems in securing a source of supply. In the meantime, Russia has launched its own gas pipeline project to southern Europe, South Stream, which is to run 900 km across the Black Sea.

South Stream is competing for the sources that Nabucco originally targeted as suppliers: Azerbaijan and, in time, Turkmenistan. Nabucco is also looking to arrange gas supplies from Iraq.

Mr. Oettinger said the EU should concentrate on diversifying its gas supplies by firstly focusing on Nabucco, secondly on the Mediterranean and thirdly on LNG and other types of transport and storage possibilities.

CCS sees coal gain acceptance

Coal was a notable inclusion in this year's World Future Energy Summit, recognition that it has an unavoidable role to play even in a carbon-constrained world. However, the extent of that role depends on how fast the industry can deploy carbon capture and storage, writes **Junior Isles**.

The World Future Energy Summit envisions a future energy mix without fossil fuels for power generation. Yet last month's event in Abu Dhabi was the first time there has been an emphasis on fossil-based power generation with carbon capture and storage. The inclusion of the technology in a conference, which has until now been predominantly focussed on renewables and energy efficiency, is an admission that fossil fuels will have an important role to play in power generation for decades to come.

Milton Catelin, CEO of the World Coal Institute said: "I believe it's the first time the Summit has held a session dedicated to CCS; it's certainly the first time the World Coal Institute has participated in the Summit. This is an interesting development. It's certainly a worthwhile development. The coal industry needs CCS, and it needs it at [commercial] scale. It provides a mechanism for our industry to manage CO₂ emissions. However the world needs CCS as well because without CCS, there can be no effective solution to global warming."

Coal provides 25 per cent of the world's primary energy and 40 per cent of the world's electricity and Catelin believes that these figures are unlikely to change for the next 30 years or more. According to BP's *Statistical Review* of 2009, coal is also the fastest growing fuel in the world, and has been for the last six years. BP estimates that reserves will last 122 years at the current rate of consumption.

With these statistics and rising global temperature, rapid deployment of CCS is critical. Catelin noted: "The question is whether it can be deployed at scale quickly enough to meet political timetables on climate change. We believe it can but it is a case of whether governments have the political will to make the substantial investments that are necessary. If they don't, then they are not being serious about the economy or the environment."

According to the IEA, CCS is needed to contribute about 20 per cent of the global climate change effort to 2050. In its *Energy Technology Perspectives 2008*, the IEA said it was not possible to halve CO₂ emissions by 2050 without CCS. It also said that the cost of CO₂ mitigation by 2050 would be 71 per cent higher per annum without coal CCS i.e. \$1.28 trillion more per annum.

The deployment of CCS at the speed necessary to meet these targets will largely depend however, on overcoming the prohibitive cost of moving the technology from pilot status to commercial scale.

SRI Consulting recently released a

techno-economic report that examines the technology and economics of three processes – monoethanolamine (MEA), advanced amine, and chilled ammonia for capturing 90 per cent of the carbon emissions from supercritical pulverised coal power plants.

Its analysis, based on new plant construction at 550 MW net power output, claims that all three processes have technical and economic issues that must be overcome before they can be implemented on a commercial scale. On a levelised cost basis with 90 per cent CO₂ capture and compression, MEA scrubbing adds 4.5 ¢/kWh, while the advanced amine and chilled ammonia processes each add 4.1 ¢/kWh to the cost of power generation.

Unfortunately, the general consensus is that there will be little financial support for commercialisation of CCS under any global climate change agreement that may supersede Kyoto.

Andrew Beatty, Partner at Baker McKenzie commented: "In the short term, the boat has already left the harbour regarding including CCS under the Clean Development Mechanism. The opportunity at the moment has gone away and is unlikely to be revisited for at least one or two years unless there is some further wide-ranging pressure on the parties to the treaty."

Jim Carter, Chairman of the Alberta Carbon Capture and Storage Development Council, Canada, believes that the economic challenge is the most serious hurdle to overcome. He noted, however, that as with other



Nick Otter: accelerating CCS deployment

speed of deployment.

The GCCSI is a public-private partnership formed last year to accelerate the deployment of CCS worldwide. It is financed by the Australian government to the tune of A\$100 million (about €50 million) per year and the goal is to identify and drive forward commercial-scale projects. The GCCSI carried out a stock-take of projects in September last year and identified nearly 300 projects.

Otter said: "Of that 300, there were about 60 that were commercial scale. However, the interesting thing is most of these projects are only in the design phase; only a few of the commercial projects have been implemented. These are mainly oil and gas projects. Taking commercial scale projects through to

much stronger. Apart from coal fired power plants there are a number of other applications and industries that will also need to capture CO₂.

Sam Nader, Director of Masdar's Carbon Management Unit, described the role of CCS in combating CO₂ emissions in Abu Dhabi. Through the Masdar initiative, the government of Abu Dhabi is undertaking a programme that will involve the construction of a 300 km CO₂ pipeline network to transport CO₂ from four facilities: a retrofit using amine-based chemical absorption on an existing 450 MW gas fired power plant; a retrofit on a power plant at an aluminium smelter; a new hydrogen production IGCC power plant; and a steel production facility. Masdar recently announced that a contract to build the Dh7 billion, 500 MW hydrogen power plant will be awarded this year, with construction starting in the fourth quarter of 2011 and completion expected by 2014.

The CO₂ from these four facilities will be sold to Abu Dhabi National Oil (ADNOC) for re-injection to oil reservoirs for enhanced oil recovery (EOR). The first phase of the project is currently in the front-end engineering and design stage and on completion in late 2014 will capture five million tonnes of CO₂ per year.

Abu Dhabi, like other countries, has realised that the use of CO₂ for EOR could be important in making the economics of CCS work.

Notably, Abu Dhabi signed a memorandum of understanding with the province of Alberta during the Summit that sets out a strategic agreement between the two governments for sharing research and evaluation and analysis on non-confidential CCS projects and technologies.

Alberta produces about 1.5 million barrels/day of crude oil from its oil sands and expects this to grow to about 3 million barrels/day by 2030.

Carter said that there is a good business case for CCS in the industry. "We believe that if we can provide CO₂ at the wellhead of conventional oil production for EOR, two things can happen: we can store about 450 million tons of CO₂ in those reservoirs and we can also virtually double the proven reserves of conventional crude oil in Alberta... this provides an additional \$100 billion which results in royalties of about \$20 billion to the government. This shows why it's important for governments to help solve the problem."

In the near term it is these developments in the oil sector that may drive the scale up of CCS and ultimately secure the role of coal in the long-term future energy mix.

"...if we can provide CO₂ at the wellhead of conventional oil production for EOR, we can store about 450 million tons of CO₂ in those reservoirs and we can also virtually double the proven reserves of conventional crude oil in Alberta."

technologies, costs will come down with commercialisation. "In the late 1970s/early 1980s, it cost twice as much to remove SO_x from coal fired plants as it does today. I'm not sure whether we will see that with CO₂ or not, but we will reduce costs."

Carter said that on average, it would cost about \$150 per tonne to capture and store CO₂. "Pipeline costs are about 15 per cent of total costs. But the big costs are in the capital cost of capture and the operating cost." He said that when considering some of the offsets such as compliance avoidance there is a shortfall of about \$50 per tonne, which, in Alberta, is being bridged by government funding.

In July 2008, the Alberta government committed C\$2 billion to CCS with plans to have three to five projects in operation by 2015. According to Carter, this is the largest per capita investment of its kind in the world. He added: "If you add this to the federal contribution of \$1 billion, Canada has contributed more than \$3 billion to CCS, so we are punching well above our weight."

While the Canadian government is making a serious effort to help provide the funding its industry needs to move to commercialise CCS projects, globally it is likely to be left predominantly to industry to realise the leap to commercial deployment.

Nick Otter, CEO of the Global Carbon Capture and Storage Institute (GCCSI), outlined the role that his institute will play in meeting what he called an "urgent need" to increase the

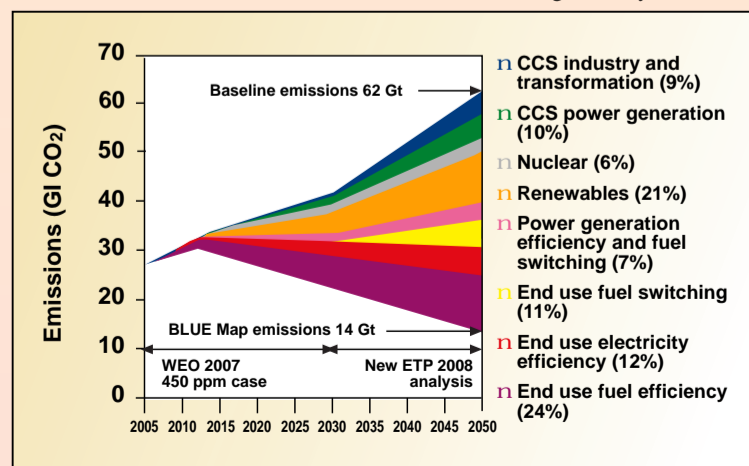
fruition and implementation is at the heart of the GCCSI."

The GCCSI therefore announced in December, a funding and support programme that will make available approximately A\$50 million per annum to support a portfolio of large scale CCS projects around the world. More than 50 applications for funding have already been received. "This shows the need for the funding that we are dispensing now," said Otter. It is expected that the successful applicants will be announced in May this year.

While applications have come from all over the world, it is the engagement of China and India that will really make a difference. Speaking on the sidelines of the conference, Otter commented: "Many Asian countries, including China and India are members of the Institute. Some may not act [on CCS] now but are in the learning process of trying to understand how they should act. China is on a real knife-edge in balancing how to satisfy the electricity needs of all their people against the impacts of climate change. India is the same but is further back along the track; they will go down the efficiency route but whether they go down the CCS route is another issue."

The thrust in India and China, according to Otter, will be in carbon capture use and storage. "The use," he said, "has come from India and China." Otter was referring to technologies where the CO₂ can be captured to help produce building materials.

Certainly the 'use' issue is becoming



In its *Energy Technologies Perspectives 2008*, the IEA said it was not possible to halve CO₂ emissions by 2050 without CCS

A cameo role for CSP

Concentrating solar power technology is scaling rapidly as developers take advantage of solar resources and favourable energy policies. The potential for the technology could yet be broadened, however, as a new project in the US is about to demonstrate.

Siân Crampsie

The heart of Colorado's Rocky Mountains may not seem like a conventional location for a concentrating solar power (CSP) plant, but an innovative project near Grand Junction is set to demonstrate that this technology need not be restricted to the world's sun belt regions.

And when commissioned in the next few weeks, it will also show how CSP can give a cost-effective 'green' boost to conventional thermal plants.

Hosted by US utility Xcel Energy at its coal-fired Cameo power plant, the project will be the first in the USA to integrate an industrial solar installation into a conventional electric power plant. As a demonstration project, it will serve as a testing ground for CSP technology in this kind of application as well as help Xcel to develop ways of improving its own environmental credentials.

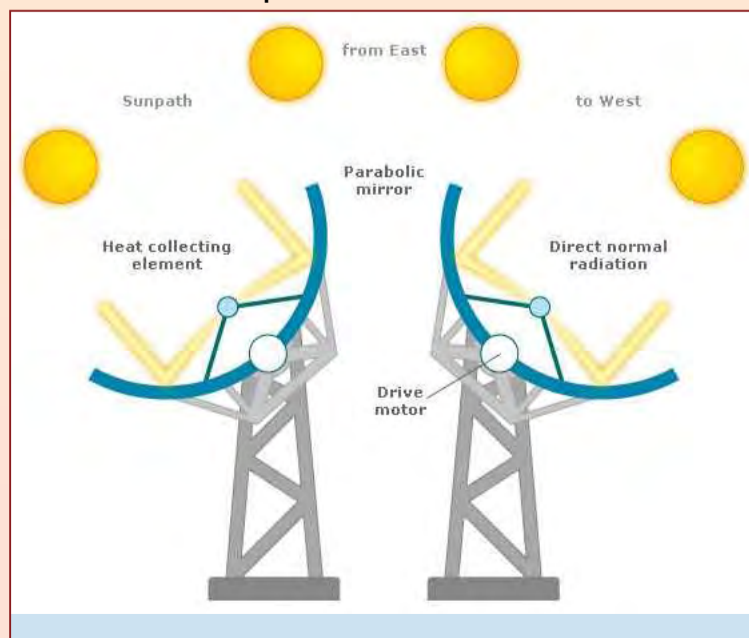
Xcel Energy is keen to increase the amount of renewable energy in its portfolio and in early 2009 proposed the creation of an Innovative Clean Technology (ICT) programme to deploy and test promising power technologies in Colorado. It is aiming to raise \$6 million per year from 2010 to 2013 to help it explore new technologies. The first project under the programme is the CSP installation at Cameo.

Nestled in the Debeque Canyon of the Colorado River east of Grand Junction, the Cameo coal plant comprises two units burning low-sulphur coal. The 73 MW plant went into service in 1957 and is now reaching the end of its operational life. This makes it the perfect candidate for the demonstration project, according to Spanish firm Abengoa Solar, which is supplying the CSP plant at Cameo.

"This is a demonstration project that is designed to help us understand the concept [of integrating CSP with conventional thermal plants] and Cameo presents an opportunity to do this in a low-risk environment as it is soon to be closed anyway," says Hank Price, Vice President of Technology Development at Abengoa Solar Inc., the Spanish firm's US subsidiary.

This means that once construction of the CSP plant is completed, it will be operated for approximately a year to evaluate the CSP technology and its impact on the coal plant. When the demonstration comes to an end, Xcel Energy will consider integrating the CSP plant into possible future generation options at the Cameo site,

Collectors track the sun during the day in order to concentrate solar radiation onto a pipe containing a heat transfer fluid at the focal line of the parabola



An artist's rendering of the CSP installation at Cameo. It will be operated for approximately a year to evaluate the CSP technology and its impact on the coal plant

or move it to another site.

The \$4.5 million project will test the use of CSP to produce supplemental steam for power generation as well as reduce coal consumption and greenhouse gas emissions at Cameo. "Xcel is trying to find the most cost-effective way of integrating solar into its system," explains Price. "Xcel is exploiting a cost opportunity here.

of CSP with conventional thermal plants means that the technology is not restricted to the world's sun-belt.

"When integrated with a coal or CCGT plant, the intermittency of solar radiation is not such a problem because you have a more robust cycle option in terms of going offline, and you don't have the problem of restarting the steam turbine," notes Price. "There are

feedwater heaters, pass it through a solar heat exchanger and then to the No. 1 HP feedwater heater."

With coal-fired plants, there is normally a concern that the integration of a renewable energy unit such as a CSP plant would disrupt the steam flow, but this is not the case at Cameo, says Price. "It will not affect steam flow through the boiler, and although it will change the steam flow through the turbine, this can be handled," he says. "So it is easily integrated."

When solar radiation levels are high and the CSP plant is helping to preheat the boiler feedwater, less extraction is required from the steam turbine. This not only means that the plant's output and efficiency are increased, but that the process is passively controlled: the extraction of steam from the steam turbine changes automatically depending on solar radiation and the contribution of the CSP plant.

"It is a 44 MW coal-fired unit and we will be increasing output by about 1.5 MW with no additional coal input," notes Price. "We could have integrated a larger CSP plant but were limited by time and budget. We just want to get a good indication of whether it will work as expected."

According to Xcel Energy, construction on the project started in the summer of 2009 and is now around 45 per cent complete. Construction efforts have been delayed by cold weather and above-average snowfall since October, as well as by later-than-expected deliveries of some solar components.

A statement from the utility says that, "Assembly of these [solar] components is expected to be completed near the end of February (all foundation work is complete) ... overall construction efforts will not be completed until the end of February."

Abengoa says that once the plant is started, it will work alongside Xcel to evaluate the technology. It will also be monitoring a new collector design based on a new aluminium structure that makes it quicker and easier to install.

The \$4.5 million project will test the use of CSP to produce supplemental steam for power generation as well as reduce coal consumption and greenhouse gas emissions at Cameo

"A standard CSP plant accounts for around 40 per cent of the cost of a new stand-alone CSP power plant but in this case the turbine and electrical system is there. This is therefore a low cost way of integrating solar energy."

The Cameo demonstration will also enable Abengoa to evaluate its CSP technology, which it believes has significant potential around the world, particularly in sun-belt regions where solar radiation is very high. According to 2009 figures from US advisory firm Emerging Energy Research (EER), the global CSP market is growing rapidly with 1.2 GW of capacity under construction in 2009 and another 13.9 GW announced globally through 2014.

Key markets for the technology include Spain, which in 2009 had 22 CSP projects with a total capacity of 1037 MW under construction and a further 5000 MW in the pipeline. In 2009 there were just 75 MW of CSP under construction in the USA, with a pipeline of 8.5 GW scheduled for installation by 2014.

Abengoa is constructing a number of major CSP projects in both Spain and the USA and is also pioneering the development of integrated CSP projects through two projects in north Africa that involve the construction of hybrid CSP-CCGT plants in greenfield locations.

Price points out that the integration

of CSP with coal fired or CCGT power plant where it makes sense as a power booster application. It expands the geography that CSP can work in; it's a second tier resource level."

At Cameo, Abengoa is adding a small parabolic trough solar field that will boost the output of the 44 MW coal-fired unit by around 1.5 MWe peak equivalent. The solar array will consist of eight 150 m-long standard eurotrough solar collectors giving a total aperture of 6540 m².

The collectors track the sun during the day in order to concentrate solar radiation onto a pipe containing a heat transfer fluid at the focal line of the parabola. The heated fluid is a mineral oil based fluid that circulates through the pipe and will reach temperatures of up to 302°C.

In a standalone CSP power plant, this fluid would circulate through a heat exchanger to raise steam for a steam turbine. At the Cameo project, Abengoa is placing this heat exchanger between the existing plant's two high pressure feedwater heaters that preheat the feedwater for the boiler.

"We are effectively adding a new feedwater heater to the coal plant by adding the solar heat exchanger between the two existing HP feedwater heaters," says Price. "We take the water out of the lower of the two HP



Junior Isles

From 'Davos' to Davos with a little TLC

One chairman at this year's World Future Energy Summit in Abu Dhabi called it the "Davos of renewable energy".

Certainly it was a grand affair. Hosted by Masdar, the conference was inaugurated by H.H. General Sheikh Mohammed bin Zayed Al Nahyan, Crown Prince of Abu Dhabi and Deputy Supreme Commander of the UAE Armed Forces, in the presence of dignitaries and prime ministers from Spain, Turkey, Greece and Malaysia to name but a few.

The growth of the conference, now in its third year, shows that the industry is serious about tackling climate change even if many of our governments are not. While some speakers remained pragmatic about the outcome of COP15 saying it was a step forward, most of the opening keynote speakers were clearly unhappy with the progress made.

The point was perhaps most strongly made by Mohamed Nasheed, President of the Republic of the Maldives who said: "Low-lying countries like the Maldives will slip beneath the rising sea. We don't have the luxury of time to meet year after year in endless negotiations ... After all, we cannot negotiate with the laws of physics; we cannot cut a deal with Mother Nature."

Mr Nasheed went on to say that the advent of electric cars, biofuels and renewables will power the 21st Century and the "green revolution" and concluded by saying that "the smart money is the green money".

Ultimately, that may be the case but at the moment, financial institutions remain cautious. Tom Curtis, global co-Head of Deutsche Bank Climate Change Advisors said investors need "TLC", not tender love and care but "transparency, longevity and certainty" of national policies in order to attract the necessary investment.

Policy uncertainty combined with the financial crisis has clearly had an impact on project finance in renewables.

John Dunlop, head of energy finance at HSH Nordbank AG pointed out that the banks had now stepped down to new lower steady-state volumes of lending which might persist for the next one to three years.

He said that banks have retreated to core regions in a temporary halt on the globalisation of finance. Eastern Europe, for example, saw a 61 per cent fall in project financing in 2009 compared to 2008 according to Dunlop.

This was echoed by other speakers who said that in addition to focusing on certain markets, lenders would also look to mitigate technology risks by, for example, only considering projects that used turbines manufactured by "first tier" manufacturers such as GE, Siemens and Vestas. The strength of the counterparties such as the off-taker and EPC contractor is also a factor in the risk mitigation equation.

Dunlop did not believe that mechanisms such as carbon credits would help secure financing either. He said: "The whole world is wasting its time with carbon credits. In practice they don't work for long-term capital investment projects. Carbon credits are not bankable, they are too volatile and too short term. The regulatory backup for carbon credits is also too susceptible to manipulation by lobby groups."

Instead of internationally traded carbon credits, he said each country should focus on its own national feed-in tariff with stiff penalties for non-compliance.

Bill Rogers, managing director of Hudson Clean Energy Partners, an independent private equity firm, said new entry financing fell from \$97 billion in 2008 to \$92 billion in 2009. "Although

there has been some improvement in the cost and availability of project financing in the last year, we need the project finance markets to return to normal levels," he said.

Despite the difficulties with project financing, the general view is that the money will be there for the right projects but there will need to be other tools apart from project financing; for example, institutional investors and corporate bonds. However, as one speaker put it, "the right matrix will have to be in place" for these sources of financing to come into play.

Nevertheless, the renewables industry

But Gross acknowledges the challenge of getting banks to invest in such technology. "So far we have invested \$170 million dollars and we are just getting started. It's very capital intensive and the question is how do you get the banks to lend money for new technologies where they don't understand how to take the economic risks or do the due diligence at all? It's really challenging. We have to educate people on how to make technical evaluations of actual technical and scientific risks on these clean-tech projects. We almost need some kind of rating system to try and help out the money that has to

high on the agenda as heads of government convened at the real Davos – the World Economic Forum (WEF) in Davos-Klosters, Switzerland that began a week after the WFES.

In a report released at the forum entitled *Green Investing 2010: Policy Mechanisms to Bridge the Financing Gap*, the WEF said that investment in clean energy has held up better than expected during the financial crisis and resulting recession, but a considerable gap still exists between current levels of investment and what is needed to begin reducing the world's carbon emissions.

In another report, *Green Investing: Towards a Low Carbon Energy Infrastructure*, the WEF stated that moving to a low-carbon energy infrastructure will require global annual investment of around \$500 billion per annum, if the increase in global average temperatures is to be restricted to 2°C.

Plenty of TLC will be required to provide such huge sums.

One of the opening WFES speeches from H.R.H. Prince of Asturias Felipe de Borbón y Grecia, Crown Prince of Spain, began by sparing a moment for the victims of the Haiti earthquake. While the Haitian disaster was understandably higher on the agenda of the WEF than the WFES, it was nevertheless a lovely gesture for a country that is really in need of TLC in its truest sense.

We need a little more TLC all-round.

Investors need "TLC", not tender love and care but "transparency, longevity and certainty" of national policies in order to attract the necessary investment

cannot afford to let lack of financing or subsidies stand in the way of progress.

Bill Gross, CEO of US company eSolar said: "People don't want to pay more for green electricity. We have to compete with fossil fuels without subsidies; it's the only way we are going to be long term. Our approach was to use less materials – less concrete, less paper, less steel. All of these commodities are becoming more expensive. The only thing that is getting cheaper is computational power. So we built a solar concentrator system that uses more computational power and less steel."

The approach allowed the company to initially raise \$20 million from Google and other venture capitalists to build a pilot scale prototype of its system. It has since progressively managed to raise financing to build a full scale system.

A small and mass-manufactured heliostat is the building block of the system. eSolar designed the heliostats for deployment in pre-fabricated 'heliostat sticks' that, according to the company, can be installed easily with minimal skilled labour.

The technology is beginning to take off. In early January the company signed an agreement to build a series of solar thermal power plants in China with a total capacity of 2 GW, in one of the largest renewable energy deals of its kind.

move towards this to make this change. These are trillion dollar shifts our economies need to make and they cannot be done with small amounts of venture capital investment."

With banks being low-risk takers by nature, governments could help by providing government loan guarantees. Gross explained: "In the US, the DOE would maybe provide guarantees on the technical risk of a new technology."

However, what renewables, like any technology, needs most is the TLC that governments can and must provide.

The environment and economics were

