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EU needs to set realistic interim targets

Europe's Energy Commissioner
Guenther Oettinger

The European Commission has revealed its new "Energy Roadmap 2050", outlining a route towards achieving its targets for greenhouse gas emissions. But some argue that it does not go far enough. **Junior Isles**

Europe's Energy Commissioner Guenther Oettinger last month revealed "Energy Roadmap 2050" to set out the route towards almost zero carbon emissions by the middle of the century.

But according to the European Renewable Energy Council (EREC), although the Roadmap highlights the crucial importance of renewables in Europe's energy future, it lacks clear direction for getting to the EU's objective of reducing domestic greenhouse gas emissions by 80 per cent by 2050.

"It correctly recognises that renewables and energy efficiency must play a much bigger role in Europe's

energy supply, now and in the long run, and that is positive," said Arthouros Zervos, President of EREC. He says, however, that the Roadmap has failed to merge renewables and efficiency in a joint scenario.

"A binding 2030 target for renewables should be based on such a scenario and is the best way to maintain investor confidence and to achieve the emission reduction targets identified in the roadmap and for ensuring sustainable growth for Europe. The renewables industry calls for a binding 45 per cent target."

Speaking at a press conference in Brussels, Oettinger said it was clear that if the EU wanted to have virtually

zero emissions by 2050, it needs a "realistic interim target". He said the Commission would be "working on a new legally binding target" and that "it may be that in two years time we can lay down very specific figures or conditions for this".

Zervos pointed out that in order to reach the goals outlined in the Roadmap, market design and energy infrastructure would have to change "but the model used in the Roadmap assumes that the market is not going to change, that the evolution will be static".

He noted that an "Energy Roadmap" needs to go beyond electricity. "Although renewable heating and

cooling is acknowledged to be vital to decarbonisation, an analysis of the heating sector is missing and deserves further investigation, as it currently represents 50 per cent of the total energy consumption in the EU," said Zervos. EREC says the roadmap does not see the three dimensions of the energy sector (power, heating and cooling, and transport) in their relation to each other, and needs to take a vision for the whole sector.

The Danish Energy Association welcomes the Roadmap and calls for decision makers to agree on a 30 per cent carbon reduction target in 2020

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The only good watt is a negawatt



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Zervos: calling for a 45 per cent binding target

and clear carbon targets for 2030 and 2040 during the Danish EU presidency to secure a strong and stable carbon price in order to drive low carbon investments.

Energy Roadmap 2050 presents a range of scenarios for a low carbon energy sector based on various combinations of energy efficiency, renewables, nuclear and carbon capture and storage. However, the EC emphasises that its scenarios are mainly illustrative not prescriptive.

The share of renewable energy rises in all decarbonisation scenarios, achieving at least 55 per cent in gross final energy consumption in 2050 compared to around 10 per cent today. The share of renewables in electricity consumption reaches 64.8 per cent in a high energy efficiency scenario and as much as 97 per cent in a high renewables scenario.

The roadmap reiterates the need to modernise the EU's energy infrastructure and underlines that investment decisions to fund these upgrades must be taken now to "avoid more costly changes in 20 years". A pan-European approach will also bring down costs and improve security of supply compared with national parallel schemes, according to the Commission.

Jason Anderson, head of EU climate and energy policy at WWF said the roadmap would remain a "pure think-piece if not backed by effective legislation. It is a mystery how the Commission imagines we will be able to transform the energy system with a carbon price rapidly approaching zero and a draft energy efficiency law that is woefully weak".

Notably, the Roadmap says that the EU can cut its emissions of greenhouse gases dramatically by 2050 without spending any more money.

Its estimate is based on an assessment that the new plants and equipment needed to switch to the generation of clean energy would cost more than continued reliance on fossil fuels, but that the clean energy itself would cost less.

"Only a new energy model will make our system secure, competitive and sustainable in the long run," said Oettinger. The Roadmap said current EU policies would reduce greenhouse gas emissions about 40 per cent by 2050.



Anderson says Roadmap could remain a "pure think piece" without legislation

Eurozone crisis sees EDP sale

- China Three Gorges becomes major shareholder in EDP
- RWE joint venture aborted

Europe's region's sovereign debt crisis continued to affect European energy companies as the government of Portugal announced the sale of its stake in state utility Energias de Portugal (EDP).

Portugal is selling the state's 21.35 per cent stake in EDP to China Three Gorges Corp. for €2.69 billion (\$3.5 billion) in what marks one of the first eurozone privatisations to go ahead in the wake of the crisis. The Chinese company will now become EDP's largest shareholder.

The deal is the first in a number of planned sell-offs in Portugal aimed at raising at least €5 billion to ease the country's crippling debt burden. Last

year Portugal said it needed a €78 billion (\$102 billion) bailout to avoid bankruptcy.

Three Gorges Corp. beat rival bids from Germany's E.On AG and Brazilian utilities Eletrobras and Cemig SA in what is Portugal's biggest ever privatisation.

The Chinese company promised to invest in developing EDP's manufacturing capacity for renewable energy equipment and in Portugal's green energy sector. Secretary of State for the Treasury Maria Albuquerque told a news conference Three Gorges would also invest up to €2 billion to acquire minority stakes in Portuguese wind farms and extend €4 billion in

credit lines to EDP, potentially lifting its total investment to €8 billion.

The sale was a blow to E.On, which had hoped to gain a foothold in the fast growing Brazilian market where EDP has a number of operations. Johannes Teysen, E.On's Chief Executive said the offer "would have been good for E.On and EDP" but E.On was not able to offer "more than what we can justify as an appropriate... investment."

German energy companies, unlike cash-rich Chinese companies, are burdened with debt and have also been hit by the accelerated closure of nuclear plants in Germany. Last year, E.On announced it would be shedding staff as part of an effort to cut costs.

E.On's German rival, RWE has been experiencing similar challenges. Its problems were further compounded when a potential joint venture with Russia's Gazprom fell through just before Christmas.

The deal, which would have reduced its debts, would have seen the JV take over RWE's gas and oil fired power stations in Germany, the UK and the Netherlands, and possibly build new ones.

For Gazprom, the deal would have brought it a step closer towards expanding from supplying wholesale gas to western Europe to the downstream business of generating electricity across parts of the region.

Jaenschwalde: CCS plans scrapped

CCS still alive

Swedish-owned Vattenfall Europe says that carbon capture and storage (CCS) is not dead, despite shelving plans to build a €1.5 billion (\$2 billion) CCS plant at Jaenschwalde.

The company had planned to add CCS by 2016 to the power station in southeast Berlin where lignite fuel is burned.

The European Union had committed a subsidy of €180 million to the Jaenschwalde project, which was to capture 1.7 million tons of carbon dioxide annually. But last month Vattenfall announced a corporate cost-cutting drive with the project as one casualty.

"The decision not to build the CCS demonstration plant does not mean we are abandoning the technology," said the company's Chief Executive, Tuomo Hatakka, speaking to *Die Welt*.

"We are pushing ahead with research and development because we believe this anti-climate-change option is badly needed." He said research on capturing carbon dioxide would continue at Vattenfall pilot plants in Germany, the Netherlands and Britain.

Last month UK electricity generator SSE plc, a subsidiary of Spanish utility Iberdrola, officially opened a carbon capture pilot plant at the coal-fired power station at Ferrybridge in West Yorkshire, UK.

The project is a collaboration between SSE, Doosan Power Systems and Vattenfall. The plant bridges the gap between the various pilot-scale trials that are under way and the commercial-scale demonstration projects envisaged by the UK government, as it captures 100 tonnes of CO₂ per day from the

equivalent 5 MW of coal-fired power generating capacity, SSE said.

Meanwhile, the technology selection process has now started for a CO₂ capture plant planned for a gas fired combined heat and power plant in Mongstad, Norway.

Both Alstom and Siemens have been chosen to take part in the technology qualification programme for a full-scale CO₂ capture plant.

Gassnova and Statoil started the international open selection process in spring last year. The technology qualification programme is divided into three phases and will last for three years.

In the first step, feasibility studies will show that the technology can be used at Mongstad. Companies must demonstrate that technologies can be

scaled up, that they have the necessary operational regularity, and that high capture ratios can be achieved in relation to energy use and costs.

The second step will focus on the demonstration plant to show that the process will work and that the emissions will be within the specified criteria. This shall include vendors' tests of chemical and process technology so that real emission data can be analysed and evaluated based on the limit set for release at Mongstad.

The third and final step will be the concept Phase for design of full scale CO₂ capture at Mongstad. Successful results in the technology qualification programme will allow for selection of technology in the first half of 2014. It is expected that an EPC contract will be awarded in 2016.

EDF and GE to develop flexible generating plant

Junior Isles

EDF and GE Energy have signed a partnership agreement to co-develop a combined cycle gas turbine (CCGT) power plant which EDF says will help it respond to increasing grid fluctuations caused by intermittent renewables.

The agreement will see the installation of GE Energy's first FlexEfficiency 50 plant. GE Energy will design, construct and commission the power island. EDF will be responsible for the engineering, procurement and construction (EPC), providing the site handling connections, civil works, and obtaining licences.

The new CCGT plant will be located

at Bouchain, an existing EDF power plant site in northern France, and will produce 510 MW. Operation is expected to begin in the third or fourth quarter of 2015.

It represents a co-investment by GE and EDF for an undisclosed sum. Ricardo Cordoba regional president and CEO of GE Energy said: "The cost will be in line with current market prices in Europe which would make it in the range of around €400 million."

The plant is expected to achieve greater than 61 per cent net efficiency at base load but equally importantly, its operating flexibility will enable it to respond quickly to fluctuations in

grid demand.

"This CCGT will help respond to an increasing fluctuation in production needs, in an environment which is seeing more and more highly intermittent renewable energy solutions, being introduced into the French electric system," said an EDF spokesperson.

According to GE the FlexEfficiency 50 can ramp up and down at a rate of 51 MW per minute and reach full rated capacity in 28 minutes. The plant can be turned down to less than 40 per cent of maximum rated load while the gas turbine itself can operate at less than 30 per cent of its rated power output, while



Cordoba: cost will be in line with current market price

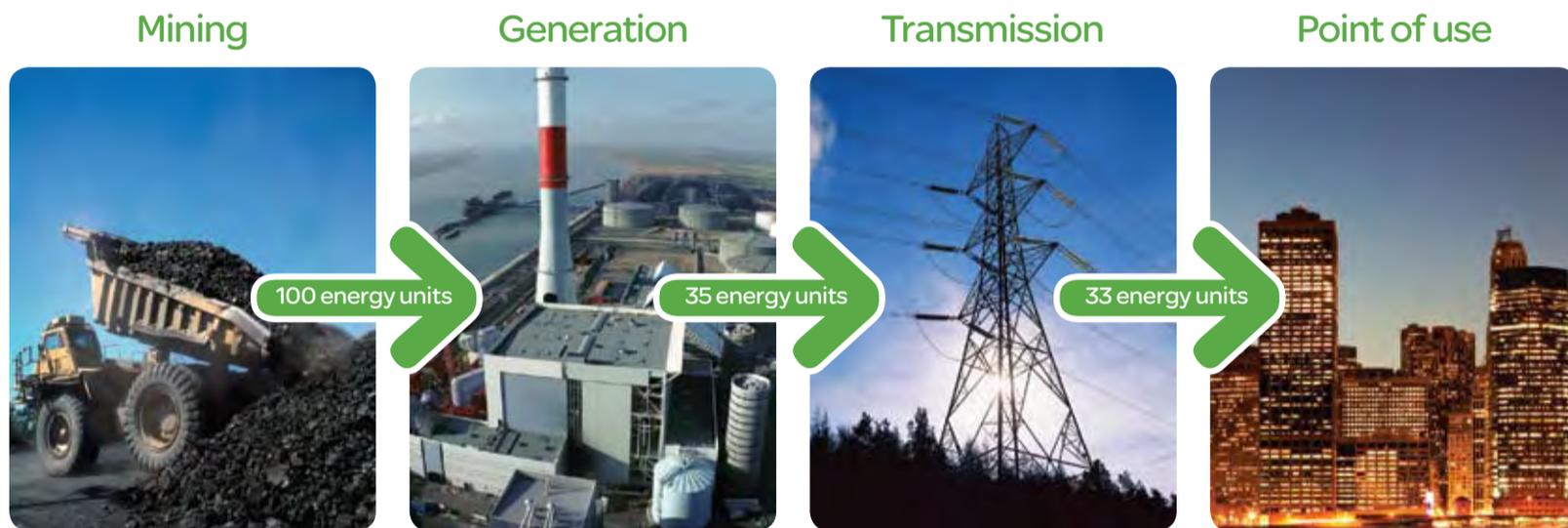
maintaining emissions compliance.

EDF has set a target of reaching an installed capacity of 200 GW by 2020, with a diversified energy mix made up of 25 per cent fossil-fired generation. It plans to replace its fuel oil fleet in France by 2023.

This latest order represents the seventh FlexEfficiency unit to be announced since its launch in May last year.

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Renewables sector calls for stable policy

Investments in the US wind and solar sector are set to drop without stable and long-term support policies.

Siân Crampsie

The renewable energy lobby in the USA is fighting to get key subsidies extended beyond their planned expiry dates.

The American Wind Energy Association (AWEA) says that long-term visibility over the production tax credit (PTC) is a key factor for attracting investors, while the Solar Energy Industries Association (SEIA) says that the loss of the 1603 cash grant programme will harm investment in solar power.

The PTC is due to expire at the end of 2012, but the solar cash grant programme, which was created by the US economic recovery programme in 2009, was due to expire at the end of 2011.

The growth in solar installations will start to slow if the grant programme is allowed to expire, argues SEIA.

Around 1.7 GW of solar capacity was installed in 2011, a rise of 89 per cent over 2010.

The growth has been driven by a strong residential market, investment in utility-scale projects as well as plummeting prices for solar photovoltaic (PV) panels, says SEIA. The SEIA believes that the industry will only see growth of 50 per cent in 2012 without the help of the cash grant system.

Similarly the US wind sector is expecting a slowdown in growth if the PTC is not extended.

The outlook in the solar sector is further complicated by a legal dispute between some US solar panel manufacturers and Chinese panel manufacturers.

A study conducted by Navigant Consulting on behalf of AWEA indicates that investment in the US wind sector will drop by nearly two-thirds to \$5.5 billion in 2013

without the PTC. AWEA believes that investors are already reluctant to commit to projects because of concerns that the tax credit system will not be extended.

AWEA wants the PTC to be extended for four years until the end of 2016, aligning it with the expiry of the solar investment tax credit.

"Tens of thousands of wind energy manufacturing jobs can still be saved if Congress addresses extenders early in 2012," said AWEA CEO Denise Bode.

According to the Navigant study, annual wind installations would fall to 2 GW in 2013, down from more than 8 GW in 2012, if the PTC were allowed to expire. It also concludes that total investment in the wind sector will grow to \$16.3 billion in 2016, up from a projected \$15.6 billion in 2012, if the PTC is extended four years.

The looming expiry of the 1603 cash grant programme has caused a rush in the solar sector to get projects underway

before the end of the year.

According to the SEIA, the fourth quarter of 2011 set a new record for installations of solar electric capacity, with 449 MW.

"The U.S. solar industry is on a roll, with unprecedented growth in 2011," said Rhone Resch, President and CEO of SEIA, in December.

"But our industry needs stable policy on which to make business decisions, and unfortunately an underlying mechanism for financing solar projects is scheduled to expire on December 31.

"To keep the industry growing and creating jobs in the US we need Congress to extend the 1603 program. The 1603 program has done more to expand the use of renewable energy than any other policy in US history."

In December a coalition of US solar panel manufacturers called on SolarWorld – the firm that is leading the legal action against Chinese solar

panel manufacturers – to withdraw its petition to the International Trade Commission and US Department of Commerce.

The Coalition for Affordable Solar Energy (CASE) is concerned that the imposition of tariffs on solar cells and panels imported from China would harm the US solar industry.

In addition to the strain that the petition is placing on US-Chinese relations, CASE says that the legal action threatens the planned installation of solar electric power systems to the amount of \$11 billion in 2012 and the potential installation of \$60 billion currently in the total pipeline.

SolarWorld believes that Chinese firms have been 'dumping' solar products on the US markets at less-than-fair value in order to gain market share. Its complaint has initiated an investigation into the Chinese solar industry's trade practices by the Department of Commerce.

Flywheel plant for sale

Beacon Power is hoping that it can find a buyer for its 20 MW flywheel energy storage plant in New York state.

The US technology firm has agreed to sell the plant as part of an agreement with the US Department of Energy (DOE) to repay a \$39 million loan.

Beacon Power declared bankruptcy in October last year but wants to continue developing other energy storage projects that it has in the pipeline. It inaugurated the Stephentown project in New York last summer.

The DOE has put pressure on Beacon to repay the \$39 million that it had drawn down from the \$43 million DOE loan it was granted for the Stephentown project, which provides the New York ISO with

frequency regulation services.

The DOE and Beacon reached settlement over the loan at a hearing in November 2011, at which Beacon also won the right to use \$3 million of cash collateral to fund its day-to-day operations.

Bill Capp, Beacon Power President and CEO, said, "Our goal was to reach a settlement agreement with the DOE Loan Programs Office and we have done that. We will now focus on attracting new capital to reorganise our company."

Beacon has other flywheel projects planned for Pennsylvania and Schenectady County, New York.

Its Stephentown project earns revenue from the New York ISO for helping to keep voltage levels on the grid stable.

Argentina eyes shale gas

YPF is expecting to make another large discovery of unconventional hydrocarbon reserves in Argentina following a major discovery in November last year.

The oil firm is drilling areas in Patagonia, southwest Argentina, near to where it confirmed in November 2011 the discovery of 927 million barrels of oil equivalent in a 428 km² field.

The 500 km² field it is now drilling

could yield another similar-sized discovery.

The results from the wells that it has drilled so far point to the possibility of a shale gas boom similar to that seen in the USA over the last five years.

The US Energy Information Administration (EIA) has put the country's shale oil and gas reserves as the third largest in the world in terms of recoverable reserves.

FutureGen looks to the future

Development of the USA's first near-zero emissions coal-fired power plant will go ahead if its developers can seal a deal to buy parts of the site where it will be built.

The FutureGen Alliance has confirmed that it is in talks with utility Ameren to buy parts of the Meredosia Energy Center, the power plant in Illinois state that will host the clean energy project.

The FutureGen Alliance is also planning to ask the US Department of Energy (DOE) to allow it to take over Ameren's cooperative agreement with the DOE, which would provide around \$1 billion of stimulus funds to the project.

Ameren was FutureGen's partner in the planned clean energy project but announced recently that it wanted to withdraw. The \$1.65 billion FutureGen project involves the repowering of the Meredosia power plant along with the construction of a carbon dioxide (CO₂) permanent storage site.

Ameren was to have been responsible for the power plant portion of the project, and says that it will continue to provide environmental permitting assistance to FutureGen.

The FutureGen Alliance says that it has identified "several hundred million dollars in potential cost reduction opportunities" in the project. It also



Coal fired generators in the US will be hoping developers can seal a deal to buy a site that will allow the development of the FutureGen 2.0 carbon capture and storage plant

announced recently that it had successfully completed drilling the characterisation well at the CO₂ storage site.

"We are very pleased that the team has successfully and safely completed drilling the characterisation well. This is an important milestone in the FutureGen 2.0 programme and was completed ahead of schedule," said Ken Humphreys, chief executive

officer of the FutureGen Alliance. "Preliminary sample testing indicates that the geology is suitable to store CO₂ from the Meredosia power plant."

He added: "Contingent upon DOE's approval, we have an opportunity to lead the entire programme, build on potential cost savings, and bring the power plant on-line in 2016 as planned."

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China intensifies carbon reduction efforts

- System to monitor atmospheric CO₂ concentration
- Solar target increased

China plans to develop its own new comprehensive system for monitoring and accurately calculating the country's greenhouse gas (GHG) emissions.

Ding Zhongli, vice president of the Chinese Academy of Sciences (CAS) said there is no comparable system currently in place and its creation will help the country find out exactly how much GHG it emits, which is essential for China's carbon emission reduction efforts.

Researchers will compile GHG emission lists for quantitative evaluation of carbon dioxide (CO₂) emissions generated through both natural process and human activities, as part of an ongoing research programme led by CAS, Ding told *Xinhua*.

The lists will cover major human activities that cause emissions such as energy use, cement production, land

use and livestock farming, said Ding.

China also plans to set up a system designed to monitor atmospheric CO₂ concentration through satellite remote sensing, aerial and ground monitoring, and atmospheric modelling, he added.

The system is part of a programme to reduce carbon intensity that also sees a continuing focus on renewable energy.

Ding said: "China should prioritise the clean use of fossil fuels, and develop clean energy including hydro and nuclear power while limiting the impact on the environment."

China recently revealed a plan to increase its 2015 solar energy capacity target from 10 GW to 15 GW. The target, disclosed by a senior official within the National Energy Administration remains unofficial until the 12th Five Year Plan for New and Renewable Energy is released

early this year.

Li Min, Hong Kong-based head of renewable energy at Taipei-based Yuanta Securities, says a 15 GW target would drive installations of 3-4 GW per year over the next four years. "As long as China has a nationwide tariff they should be able to exceed this target," he told *Energy Finance*. Beijing implemented a provisional feed-in tariff in August that is driving installations of 2-3 GW this year. This compares with a base of only 800 MW at the end of 2010.

Government sources have said in the past that Beijing would wait until solar could match the price of wind power before supporting the sector's development on a large scale. "What they are doing right now is building demonstration projects to see how cheap solar energy can be," said Li. But with solar panel prices dropping by



China will monitor GHG emissions from several sectors

about 40 per cent in 2011 alone, Li says solar will be cheaper than wind "in the next two to three years".

In early December, the State Electricity Regulatory Commission (SERC) also said it plans to double wind capacity in three years. It said the nation's installed capacity of wind power would hit 100 GW by 2015. Statistics show there were 486 wind farms connected to the grid by the end of August 2011, with an installed capacity of 39.24 GW, with

another 13.77 GW under construction.

SERC said wind power generation in the first 10 months of 2011 rose 57 per cent compared to the same period in 2010 and accounted for 1.5 per cent of the nation's total electricity output.

China's power consumption rose 9.9 per cent to 383.6 billion kWh in November from a year earlier, the slowest growth in three months, according to the National Energy Administration (NEA).

New Zealand privatisation to begin this year



Finance Minister Bill English

New Zealand power company Mighty River Power will be the first of four state-owned energy companies to be prepared for an initial public offering (IPO). According to the government, the IPO is likely to go ahead in the third quarter of this year, subject to market conditions.

The National Party-led government says that a 49 per cent share in Mighty River and three other energy companies, including Genesis, Meridian and Solid Energy, and a sell-down of its majority stake in Air New Zealand were necessary to reduce the national deficit.

The government will retain at least 51 per cent control of the companies. New Zealanders will be given priority for shares; and no shareholder other than the government will be able to own more than about 10 per cent. Ministers expect New Zealand ownership will be around 85-90 per cent.

Finance Minister Bill English and State Owned Enterprises Minister Tony Ryall said that the government had made three clear promises to New

Zealanders about "mixed ownership" companies.

"Mixed ownership is a win-win," said the statement, adding: "It's an opportunity for New Zealanders to invest in something other than housing or finance companies. And it will free up taxpayers' money so the Future Investment Fund can invest in priority new assets like schools, hospitals and irrigation, without having to borrow from overseas lenders."

"It will also improve the efficiency of the mixed ownership companies, while the government retains majority control," it said.

The cabinet has agreed in principle to implement legislation to allow the mixed ownership programme to proceed, which would be needed to remove any of the companies from the State Owned Enterprises Act.

The statement said Mighty River Power was well positioned to take to market.

The Treasury has been given the go-ahead to start advertising for advisors to run the IPO process.

Australia supports renewable start-ups

A \$200 million fund to be launched this year will help companies looking to start operations in the renewable energy sector.

Renewable energy companies starting up in Australia this year will find it easier to source venture capital following the launch of the nation's largest renewable energy venture capital fund.

Australian Energy Minister Martin Ferguson said the federal government will contribute A\$100 (\$98.89 million) to the fund that would be matched dollar for dollar by Asian investor Softbank China Venture Capital, making available a total of A\$200 million to support renewable energy companies.

The renewable energy fund will assist high-potential Australian renewable energy start-up companies by making critical, early-stage equity investments, the Minister said.

"While Australia has many innovative companies developing renewable energy technologies, early-

stage companies with a limited operating history have found it difficult to source venture capital," Ferguson told reporters.

"This fund will provide capital finance and active management to help promising Australian renewable energy companies to achieve commercial success in Australia and overseas markets."

Ferguson said it would be up to the venture capital fund to decide which companies to give funding to.

"There is no direction. There is no suggestion they should favour one form of clean energy over another or segment the industry and decide x percentage has to be renewable or whatever. It's about which proposals put in front of the fund managers actually stack up," he said.

The fund, which will be managed by Southern Cross Venture Partners Pty

Ltd, is expected to be operational early this year and will actively seek further private sector funding to support its portfolio of companies.



Bright ideas: funding will help promising companies

Thailand to increase alternative energy consumption

Thailand's latest plan to increase consumption of alternative energy to 25 per cent within 10 years could lead to a significant drop in crude oil imports.

The National Energy Policy Council (NEPC) has approved the new alternative energy plan. From 2012 to 2021, alternative energy consumption would be raised from 7400 kilotonnes of oil or equivalent – the amount of energy released by burning that amount of crude oil – to 25 000 ktoc.

In electrical energy terms, the consumption would be raised from 86.06 MW to 290.75 MW, or 25 per cent of total consumption.

The new plan supersedes two previous alternative energy plans – the 15-year one in use since 2008, and the 20-year one in use since 2011.

Suthep Liumsirijareern, Thailand's director-general of the Energy Policy and Planning Office, said that under the new plan, wind power demand capacity would be raised to 1200 MW,

solar power to 2000 MW and biomass to 3600 MW.

Meanwhile, German-based Galip GmbH is joining with Four Us Technology (Thailand) to invest over Baht8 billion in solar power plants with a combined capacity of 84 MW in Thailand.

The Baht8.2 billion (\$260.7 million) investment will cover seven provinces in Thailand starting with a pilot project in Phrae province with 24 MW.

Fukushima pushes up price of nuclear generation

A draft report from a Japanese government panel says that nuclear power generation costs 8.9 Yen/kWh when including expenses associated with nuclear accidents – higher than a 2004 projection of 5 to 6 Yen/kWh.

The new estimate, calculated by considering the result of the nuclear accident at the Fukushima Daiichi power plant, states that nuclear power is still one of the cheapest energy sources but notes that 8.9 Yen/kWh is the “minimum” cost of nuclear power as the total damage costs of a severe nuclear accident are yet unclear.

The report puts the cost of electricity from coal-fired plants at about 9.5 Yen/kWh and 10.7 Yen/kWh from gas fired plants, reflecting higher fuel prices. In the 2004 projection, the cost of electricity from coal plants was estimated at 5 to 7 yen per kWh, and 6 to 7 Yen/kWh from LNG fired plants.

The cost of electricity from land-based wind power is estimated at between 9.9 and 17.3 yen/kWh and 33.4-38.3 Yen/kWh for solar power, compared with earlier projected costs of 11 to 26 yen/kWh and 37 to 46 Yen/kWh, respectively.

The calculations are part of the process of reviewing the country's energy policy following the Fukushima Daiichi plant disaster.

The latest estimates are different from

the 2004 figures because they include what the panel calls social expenses, in addition to capital, fuel and operation and maintenance costs.

Social expenses are included in costs for nuclear power generation in the form of accident risk costs, and for thermal power generation in the form of costs to deal with carbon dioxide emissions.

So far the panel estimates damage costs to be at least Yen 5.8 trillion (\$74.5 billion). But, this figure does not include, for example, expenses related to cleaning radiation-contaminated land around the plant.

Last month the Japanese government said it is considering injecting another Yen1 trillion (about \$12.9 billion) into Tokyo Electric Power Company (Tepco) from public funds and additional bank lending to keep the operator of Fukushima No.1 power plant running steadily.

According to reports, Tepco is considering cancelling the construction of new thermal power plants and selling some existing ones to secure compensation funds for the crisis at the Fukushima plant. Tepco will decide by the end of March which of its 15 operating thermal stations will be sold.

Following the sell-off, the utility will procure electricity from independent power producers (IPPs). Details of the

bidding process will be decided by the end of January.

Meanwhile, it was announced last month that the Fukushima Daiichi plant was stable and close to cold shutdown, nine months after the accident.

Prime Minister Yoshihiko Noda said temperatures inside the plant's three melted reactor cores are almost consistently below the boiling point and radiation leaks have significantly subsided – two key conditions for cold shutdown.

Experts caution, however, that progress should not be overstated, and that problems could still arise.

“Tepco and the government are anxious to bring a certain closure to the crisis,” said Kazuhiko Kudo, a nuclear physicist at Kyushu University. “It would be a problem if the announcement gives an impression that the plant has received an official safety certificate.”

The cold shutdown would mark the end of the second phase of the government's lengthy roadmap to completely decommission the plant – a process that could take 40 years, authorities have said.

■ Japan's House of Representatives last month approved bilateral civil nuclear cooperation accords with Jordan, Russia, South Korea and Vietnam.

Malaysia prepares for next wave of IPPs

Malaysia is preparing to cater to new demand beyond 2016 with the start of the bidding process for the replacement of generating capacity currently provided by the country's independent power producers (IPPs).

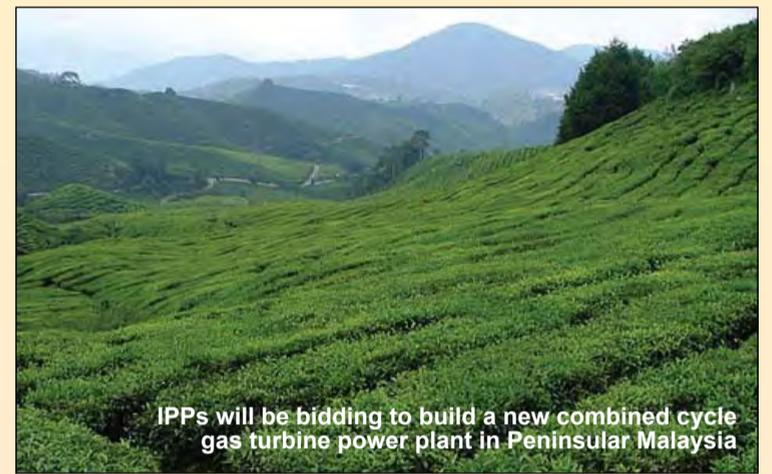
The Energy Commission (EC) kicked off the process for 4500 MW of new capacity with the issuing of a notice for prospective bidders to build a combined cycle gas turbine (CCGT) power plant in Peninsular Malaysia. The plant will sell its capacity and energy to Tenaga Nasional Bhd (TNB) under a new power purchase agreement (PPA).

IPPs currently account for 4115 MW of generating capacity under the first generation of PPAs signed in the

1990s.

The first generation PPAs were signed by: YTL Power International Bhd; Malakoff Bhd's subsidiary, Segari Energy Ventures Sdn Bhd; Tanjong plc's subsidiary, Powertek Bhd; and Genting group's power division, Genting Sanyen Power Sdn Bhd.

TNB had recently announced that the first generation PPAs, expiring between 2015 and 2016, would not be renegotiated and would be allowed to lapse. TNB president and chief executive officer Datuk Seri Che Khalib Mohamad Noh had said, however, the IPPs could still participate in the bidding process for new licences that would be held by way of open tender.



IPPs will be bidding to build a new combined cycle gas turbine power plant in Peninsular Malaysia

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Lawmakers back carbon allowance cull



The European Commission looks set to tweak the region's emissions trading scheme in order to prop up the carbon price and spur investment in green technologies.

Siân Crampsie

Carbon allowances could be withheld from the market in the next phase of the European Union's Emission Trading Scheme (ETS) after lawmakers in the region backed changes to an energy efficiency bill.

The proposed changes would enable the European Commission to withhold carbon allowances, which give industries the right to emit carbon dioxide (CO₂), and to auction allowances that it had planned to give away for free.

The proposals come in response to a drastic drop in the price of carbon allowances over the last six months and calls from industrial groups for the carbon price to be 'propped up'.

In December the price of carbon allowances dropped to a historical low of €6.30. They immediately rose by 20 per cent after the majority of the

members of the European Parliament's cross-party environment committee voted in favour of changing the draft energy efficiency directive.

Carbon prices were also bolstered by the European Commission's unveiling of its Energy Roadmap 2050, which outlines plans to decarbonise Europe's energy system and cut emissions by over 80 per cent by 2050.

Energy users argue that in order to make investments in low carbon technologies, they need a stable carbon price. Last month the EU Corporate Leaders Group on Climate Change (EUCLG) said in a letter to José Manuel Barroso, European Commission president that the ability of the ETS to deliver cost-effective reductions in greenhouse gas emissions was in doubt.

EUCLG, which includes industrial giants such as Unilever, Tesco and Alstom, said in a statement that "the

simplest and most deliverable route" to reduce emissions was "through an urgent recalibration of Phase III of the ETS by withholding allowances and designing a robust Phase IV that will send the right long term price and investment signal and will immediately strengthen the carbon price".

Carbon prices have been depressed by an oversupply of emission allowances and the eurozone crisis, said EUCLG. It also noted that some national and international policies – including the proposed energy efficiency directive – could continue to dampen demand for emission allowances if not properly aligned with the ETS.

"We strongly support the energy efficiency directive, and welcome increased energy efficiency leading to CO₂ reductions across all sectors," said EUCLG in a statement. "Increasing energy efficiency in those installations covered by the ETS is likely to reduce

their emissions, and may result in a 13.9 per cent reduction in 2020 year end carbon prices as shown by the Commission's own EED Impact Assessment.

"It is therefore imperative that these potential impacts are taken into account and measures are put in place to ensure the viability of the ETS before it is too late."

The European Commission could withhold up to 1.4 billion emission allowances, equivalent to around eight per cent of the emission cap in phase III of the ETS. Environmental organisation WWF has also called for the ETS to be strengthened in phase III and said in a recent policy paper that if this is achieved, then the ETS and energy efficiency directive could work hand in hand to achieve carbon reduction goals.

A recent report from the European electricity association Eurelectric

revealed that the carbon intensity of the region's power generation mix is actually rising in spite of the growth in renewable energy generation.

Eurelectric's data shows that while emissions of carbon dioxide from Europe's electricity sector fell to 1127 Gt in 2009 from 1186 Gt in 2008, the carbon intensity of the power produced rose slightly to 369.7 gCO₂/kWh from 368.4 g CO₂/kWh.

It believes that the increasing share of variable generation technologies such as wind power and solar power calls for increasingly flexible use of fossil fuel power plants, leading to higher emissions from these plants than they would normally emit in baseload operation.

Eurelectric says that 22 GW of renewable energy capacity was added to Europe's generation mix in 2010, compared with just 8 GW of fossil fuel capacity.

Denmark presents decarbonisation plan



Denmark plans to increase its CO₂ reduction target from 20 to 40 per cent by 2020 and phase out fossil fuels by 2050

The Danish government has set out ambitious new renewable energy goals that it hopes will stimulate the economy and promote the development of green technology.

It has increased the country's carbon dioxide (CO₂) reduction target from 20 to 40 per cent by 2020, and also wants a complete phasing out of fossil fuel use by 2050.

The estimated cost of the scheme is DKR5.6 billion (\$983 million), which will largely be met by consumers. The plan would create 900 extra jobs in 2012 and 5500 more in 2013, says the government.

The Danish energy association Dansk Energi says that the plan is

ambitious, but not impossible. The real challenge would be to get the maximum benefit from the fluctuating nature of renewable energy, Dansk Energi CEO Lars Aagaard told *European Energy Review*.

"We will need to introduce big heat pumps in the district heating system – replacing coal, gas and biomass," said Aagaard. "We will also need plans for converting individual heating from oil- and gas fired boilers to heat pumps and for using electricity to power cars. And then we will need to have much more capacity in transmission lines to the rest of Europe, including new transmission lines to e.g. the UK."

UK opts for capacity auctions to keep the lights on

- Proposals broadly welcomed
- Carbon reductions on track

A proposal for a new capacity market in the UK will give power companies the confidence they need to make the £200 billion worth of investments needed in the country by 2020, say utilities.

The capacity market would ensure that there is enough electricity generating capacity during times of very high demand or when the availability of intermittent sources of energy such as wind falls. The additional capacity would help to avoid power price spikes and potential blackouts.

The mechanism aims to encourage plant developers to build new power stations by creating a market that would generate stable revenue for them. It is the latest in a raft of reforms to the power market proposed by the UK government, which is keen to attract investment to the nation's ageing power infrastructure.

The capacity market would require generators to bid into capacity auctions worth £2.88 billion until 2030. Plant owners would have to commit to providing power when needed or face penalties.

The cost of the scheme, which will be operated by system operator National Grid, will be passed on to consumers but the government says the increases will be four per cent lower than if the market were left as it is now.

David Porter, Chief Executive of the Association of Electricity Producers said that the scheme was "another step in the right direction to getting the investment needed to replace old power stations, meet renewable energy targets and keep the lights on in the UK."

"The details... will help to provide companies and investors with the confidence to make the £200 billion worth of investment in energy infrastructure in the next nine years".

The UK government last month also announced its carbon plan, setting out how the country will meet its emission reduction target of 80 per cent of 1990 levels by 2050.

It says that UK emissions have already been cut by more than 25 per cent and says that it will focus on energy efficiency as well as supporting a range of technologies to drive innovation in clean technologies.



Supercritical plant set for Poland

EDF has announced plans to reinforce its position in the Central and East European power market by constructing a 900 MW supercritical coal fired power plant in Poland.

The €1.8 billion project will replace four existing units at the Rybnik power plant with a single, more efficient unit capable of burning up to ten per cent biomass.

It is a key part of EDF's plans to expand in the region and will also help to meet growing electricity demand in Poland. Commissioning of the new plant is scheduled for 2017.

South Africa launches SARi

■ Initiative to mobilise financing and expertise ■ Renewable IPPs named

Siân Crampsie

South Africa is to work with international partners in order to secure the growth of its nascent renewable energy industry.

The country has created the South Africa Renewables Initiative (SARi) and signed a declaration of intent with the governments of the UK, Norway, Germany and Denmark that aims to mobilise both funding and expertise for renewable energy projects.

The European Investment Bank (EIB) has also signed the declaration, which was launched in December at the international climate talks in the South African city of Durban, where South Africa also announced preferred bidders in the first round of the country's renewable energy independent power producer (IPP) programme.

SARi will play an important role in South Africa's ambitions to cut greenhouse gas emissions by 34 per

cent by 2020 and will also help to kick-start a clean-tech manufacturing sector in the country.

"Renewable energy is an opportunity for Africa," said South African Minister of Trade and Industry Dr. Rob Davies. "African countries need to become producers as well as consumers of tomorrow's technologies. As South Africa begins to roll out large scale renewables, we are seeking to do this in a way that maximises industrial and job creation benefits."

South African President Jacob Zuma said that the biggest barriers to developing renewable energy in Africa were not technical, but financial. "The South African Renewable Initiative (SARi) funding mechanism will help us unlock South Africa's green growth potential through the funding of large-scale renewable developments," said Zuma. "This will be achieved with the assistance of global partners – donors and governments – who will provide

innovative funding solutions to facilitate it."

The country's green energy targets will add an average incremental cost of \$660 million to South Africa's annual electricity bill up to the year 2044. "The SARi model will enable us to deal with the high cost through low cost loans and other financial instruments combined with time limited pay-for-performance grants," said Zuma.

South Africa's current Integrated Resource Plan (IRP) calls for the development of 18 GW of renewable energy by 2030. In the first round of the country's renewable IPP programme, the government named the preferred bidders for 1415 MW of wind, solar photovoltaic (PV) and concentrated solar power (CSP) projects.

"This represents a historic milestone in our country, and it is a demonstration of our departure from being associated with high greenhouse gas emissions,

Durban, South Africa, location where international climate talks were held

high water usage, health externalities and other environmental degradation," said South African Energy Minister Dipuo Peters.

"As you can appreciate, a lot more still needs to be done to put our country on a low carbon trajectory in a way that balances our country's own imperatives against our responsibilities as world governments."

The government named preferred bidders for 18 solar PV projects with a capacity of 631 MW, and eight wind power project totalling 634 MW. Abengoa Solar was named the preferred bidder for the only two CSP projects.

All of the projects will be supported

by 20-year power purchase agreements with Eskom. Companies named as preferred bidders include Mainstream Renewable Power, Basil Read, Red Cap and Solar Capital.

"I congratulate Minister Peters for putting in place a process which is truly world-class and for the superb manner in which it has been executed," said Mainstream Renewable Power CEO Eddie O'Connor.

"The government has shown tremendous vision and foresight in creating this new and sustainable industry for South Africa, firmly placing it on the world map for renewable energy generation."



Emerging economies drive demand for coal

China's massive appetite for coal could affect coal prices and drive up electricity prices over the next five years

The International Energy Agency (IEA) has raised concerns over China's massive appetite for coal, which could affect coal prices as well as electricity prices over the next five years.

The IEA's latest analysis of the medium term coal market shows that China, India and other emerging markets will drive growth for coal, which remains the single largest

source of fuel for electricity generation around the world. Average coal demand is set to grow by 600 000 tonnes every day over the next five years.

China's domestic coal market is more than three times the global coal trade. Only 15 per cent of global coal demand is met through international trade, yet more than half of global coal demand during the IEA's outlook period is

projected to come from China.

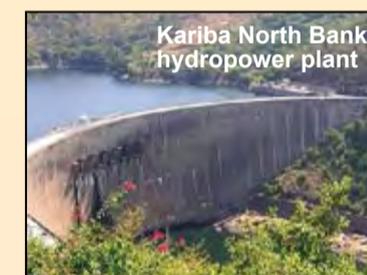
"What happens in China over the medium term may impact the prices for electricity that consumers everywhere will have to pay," said Maria Van der Hoeven, IEA Executive Director.

The IEA's analysis also shows that the growing demand for coal means that poorer coal deposits will have to be explored, which will produce

upward pressure on mining costs and therefore coal prices. The perception of coal as a cheap and secure energy resource will be tested in the years ahead, says the IEA. Six countries account for more than 80 per cent of global coal exports.

"Policy makers must be aware of this when designing strategies to enhance energy security while tackling climate change," said van der Hoeven.

Kariba deal in the balance



Zimbabwean utility ZESA has urged the government to cancel a deal with a Chinese firm for the construction of an extension to the Kariba South hydropower project.

The Zimbabwean government signed an agreement with Sino Hydro in 2011 but ZESA says that a more transparent tender process should have been carried out.

The project seeks to expand the 750 MW Kariba South hydropower plant on the Zambezi river along the border between Zimbabwe and Zambia by up to 600 MW. The project is seen as vital to Zimbabwe because of a shortfall in power generation capacity.

Saudi taps solar desalination

Solar power could play an increasing role in the Saudi Arabian desalination sector under plans unveiled by the country's Water and Electricity Minister Abdullah Al-Hussayen.

The country wants to cut the use of fossil fuels and make use of alternative sources of energy, and has disclosed plans to set up a solar powered desalination plant within 18 months.

The use of solar energy in desalination plants will also be developed by Japan's Hitachi Zosen Corporation, which has signed an agreement with Saline Water Conversion Corporation (SWCC), which operates more than 30 desalination plants in Saudi Arabia.

■ An ACWA Power-led consortium has issued notice to proceed with the construction of the Qurayyah power plant, the largest independent power generation project in the world. The 3927 MW project will be developed by the Hajr Electricity Production Company and is due to start operating in 2014.

Banks forge climate change initiative

More than half the world's population resides in urban areas



Five of the world's multilateral development banks have joined forces to develop a common approach to help cities better adapt to climate change.

The World Bank, Asian Development Bank, European Bank for Reconstruction and Development, the

African Development Bank and the Inter-American Development Bank say that they will develop common tools and metrics to help cities to assess climate risk.

The five banks already lend around \$8.4 billion annually to tackle problems relating to climate change in

cities, and say that the initiative is particularly timely given urbanisation rates in some parts of the world.

The initiative involves the development of common tools and metrics to help cities assess climate risk, such as standardised greenhouse gas inventories and encouraging a

consistent suite of climate finance options.

Cities account for over two-thirds of global energy consumption and are therefore "critical in the fight to tackle climate change", said World Bank vice president for sustainable development Rachel Kyte.

Siemens set for expansion in Chinese wind market

- Two JVs will serve China and global network
- Gamesa opens sixth manufacturing plant in China

Siân Crampsie

Siemens says that a new strategic alliance with Shanghai Electric represents a major breakthrough for the development of its business in China.

The two companies have agreed to form two joint venture companies serving the Chinese wind power market as well as Siemens' global supply network.

Siemens will own 49 per cent of the two joint venture firms, and Shanghai Electric the remaining 51 per cent. The deal is part of Siemens' strategy to regionalise its wind power business in key markets and will give the German firm access to local competence and Chinese customers in the world's largest wind power market.

It will give Shanghai Electric access to Siemens' expertise in terms of manufacturing, technology and management of both onshore and offshore wind power equipment and projects.

"We see the agreements with our long term partner Shanghai Electric as the breakthrough for Siemens in the world's most important wind power market. With the two joint ventures we're now optimally positioned to participate in this strong market," said Michael Suess, member of the Managing Board of Siemens AG and CEO of the Energy Sector. "Our target is to become one of the world's leading suppliers of wind turbines."

Siemens will provide the joint ventures with its wind turbine technology and experience in project

execution and servicing.

China's installed wind power capacity stands at over 40 GW and the country has plans to reach an installed capacity of 150 GW by 2020. The two companies' joint ventures will engage in R&D activities as well as wind turbine production, and will also undertake sales, marketing, project management and servicing in China.

The agreement comes as continued uncertainty and growing levels of risk in the European and North American renewable energy markets force both developers and manufacturers to look further afield for attractive growth opportunities.

Last month saw Spanish wind turbine group Gamesa establish its sixth manufacturing plant in China.

Gamesa's new manufacturing plant

is the company's fourth in the city of Tianjin and will be devoted to the manufacture of control cabinets. It says that its production capacity in the country now exceeds 1000 MW and that it employs 1200 people in China.

Gamesa started operating in China in 2000 and has installed nearly 3000 wind turbines there. China now accounts for 21 per cent of Gamesa's total sales.

Earlier this year Siemens and Shanghai Electric secured an order for an offshore wind farm in China. Siemens opened a rotor blade production facility in Shanghai in late 2010 and in 2011 based its Asia-Pacific wind power business unit in the same city.

Elsewhere, Siemens has boosted its capabilities in the gas turbine market, announcing plans for a new production facility in St Petersburg, Russia and a

new combustion test centre in Germany. It has also officially opened a new gas turbine manufacturing plant in North Carolina, USA.

In Russia Siemens has teamed up with Power Machines to construct a new facility for manufacturing gas turbines for growth markets in the CIS region. It will start operating in 2014 and will also undertake R&D, sales, marketing and service activities, says Siemens.

Siemens is planning to invest €66 million to establish a new combustion test facility for gas turbines in Ledwigsfelde, near Berlin. The test centre will play an important role in the development of the company's gas turbine technology and means that Siemens will no longer be reliant on external facilities to test and validate its designs.

Areva presents strategic plan

Areva has laid out details of a five-year plan that aims to improve the firm's finances and strengthen its business performance.

The French state-owned giant has announced plans to cut jobs and suspend projects around the world after a difficult year and the news that it will report operating losses of up to €1.6 billion for 2011.

It says that it is aiming to become a major player in the renewable energy sector and has stated its confidence in the future of the global nuclear power sector.

Areva said last month that it is going to take a €2.4 billion writedown because of the collapse in value of a uranium mining venture and other charges related to its nuclear business, including cost overruns and delays at the EPR project in Finland.

The company's new boss, Luc Oursel, says that the firm will cut yearly costs by at least €1 billion by 2015 and sell at least €1.2 billion of assets to reduce debt and return the group to profitability. He is also likely to cut jobs in France and has suspended the development of

Luc Oursel: looking to improve financing and strengthen performance

the \$3 billion Eagle Rock uranium enrichment facility in Idaho, USA.

A hiring freeze will be implemented in France, where the government has said that Areva may not cut jobs. Areva will cut its total investments by 34 per cent to €7.7 billion over the 2012-2016 period.

Around €1.5 billion of the €2.4 billion of financial charges in 2011 is attributable to Areva's 2007 purchase of UraMin, a Canadian company with operations in Namibia. Oursel's predecessor, Anne Lauvergeon, sanctioned the €1.8 billion purchase of UraMin when uranium prices were trading at around \$303/kg (\$138/pound).

The slump in uranium prices following the Fukushima disaster and the news that deposits at UraMin's mines are smaller than expected has

led to the collapse in the firm's value.

Areva has set up a special committee of three independent supervisory board members to investigate the UraMin acquisition. The company also says that its earning will be hurt by a drop in the number of new reactors being built around the world.

It forecasts the global installed base of nuclear reactors will grow to 583 by 2030 from 378 last year. That represents a decrease from Areva's forecast last year that the installed base would grow to 659 over the next 20 years.

"The dynamics of our plan are rooted in our confidence in the future of nuclear and renewable energies," said Oursel. "The plan aims to strengthen our leadership in the nuclear market, make us emerge as a leading player in renewable energy and give us the resources to achieve these goals."

Fuel cell alliance targets Europe, Latin America

FuelCell Energy and Abengoa have joined forces to take advantage of "excellent prospects" for the development of distributed energy projects in Europe and Latin America.

The two companies have established a partnership agreement to develop megawatt-scale power plants for small utilities and industrial users based on FuelCell Energy's carbonate fuel cell technology. Their first project will be a 300 kW pilot installation at the Abengoa headquarters in Palmas Campus Palmas Altas, Spain.

The venture will specifically target Europe and Latin America, where Abengoa already has a presence, and will also target renewable biogas markets.

Abengoa will use its experience with liquid biofuels to develop a fuel processing system that will enable the use of biofuels in FuelCell Energy's DFC modules.

"Abengoa has experience developing fuel cell systems with value added capabilities," said Chip Bottone, President and Chief Executive Officer for FuelCell Energy. "When combined with their European and Latin American business and marketing reach through the Abengoa

organisation, we see excellent prospects for market expansion in Europe as well as developing the Latin American market for ultra-clean baseload distributed generation fuel cell power plants."



Abengoa headquarters: will host 300 kW pilot installation

Tepco faced with nationalisation

Tokyo Electric Power Company (Tepco), owner of the stricken Fukushima nuclear power plant in Japan, is under renewed pressure over its financial future and may be forced to consider a plan to nationalise.

The utility has already struck a deal with the Japanese government to help it meet compensation payments related to the disaster at the Fukushima plant that led to radioactive contamination.

However, it may be forced to accept

a capital injection from the government in return for an equity stake to help it finance the decommissioning of the plant, estimated to cost ¥1100 billion (\$14.1 billion).

The utility is raising funds by selling

non-core assets, including telecoms carrier KDDI and Kanto Natural Gas Development. In November 2011 it received ¥890 billion in government aid as well as ¥120 billion from a government insurance scheme covering

nuclear accidents.

Regarding compensation payments, Tepco said it would continue to do its "best to ensure the indemnification payment process is as smooth as possible for all applicants".

Tenders, Bids & Contracts

Americas

Hitachi bags ¥15 billion order

Kansas City Power & Light (KCPL) has placed an order worth ¥15 billion (\$192 million) with Hitachi Power Systems America Ltd for air pollution control equipment for the La Cygne coal fired power plant.

The equipment will remove sulphur and nitrous oxides from the power plant's exhaust gases and is needed to meet federal and state air quality regulations.

SunPower to supply NRG project

SunPower Corp has signed a deal with NRG Solar to supply 54 MW of its solar power technology to support NRG's portfolio of power projects.

Under a supply agreement, SunPower will deliver 24 MW of solar panels to NRG by the end of 2011. The panels will be used in NRG's 26 MW Borrego solar project in California as well as other development projects.

The two companies recently celebrated the start of construction of the 250 MW California Valley solar ranch project in California.

Vogt to supply Lakeside 2 HRSGs

Vogt Power International Inc. has received an order from Siemens AG to supply heat recovery steam generators (HRSGs) and associated equipment for the Lakeside 2 electric generating facility located in Utah, USA.

Vogt Power will design and deliver two fired three-pressure level HRSGs with reheat for use behind Siemens SGT6-5000F gas turbines. The Lakeside 2 project will consist of a natural gas fired, combined cycle combustion turbine generating plant producing 637 MW of electricity with an in service date of June 2014.

New CCGT for New Jersey

US-based CH2M Hill has been awarded an engineering, procurement and construction (EPC) contract for a 738 MW combined cycle power plant project in West Deptford Township, in the US state of New Jersey.

The natural gas fired facility will produce enough power for approximately 600 000 homes and will be designed to meet stringent air and noise emissions requirements. Construction will start in 2012 and commercial operation is scheduled for 2014.

CH2M Hill's contract includes all site and civil work, the supply and installation of two advanced technology Siemens SGT6-5000F combustion turbine generator units, two heat recovery steam generators, one steam turbine generator, and complete balance of plant, including commissioning and startup.

R-R enhances role in Brazil

Brazilian oil firm Petrobras has awarded Rolls-Royce contracts worth up to \$651 million to supply power generating equipment to support its oil production activities.

Rolls-Royce will supply Petrobras with 32 RB211 gas turbine power generation packages, including waste heat recovery units, to meet the power generation requirements of eight separate Floating Production Storage and Offloading (FPSO) vessels.

The FPSO vessels, which are used for the processing of hydrocarbons and storage of oil, will operate in the Lula (formerly Tupi) and Guarã oilfields.

The new gas turbine power generation packages will be delivered in groups of four, with the first units scheduled for delivery in the first quarter of 2013. Four gas turbine generating sets will be installed on each of the eight FPSOs.

Asia-Pacific

MHI to build 1600 MW CCGT

Gulf JP NS Company (GNS) has placed a turnkey order with Mitsubishi Heavy Industries (MHI) for the construction of a 1600 MW gas turbine combined cycle (CCGT) power plant in Thailand.

The 2 x 800 MW plant will be built in Nong Saeng district, Saraburi Province and is a major part of the Thai government's electric power development plan. Energy from the facility will be sold to Electricity Generating Authority of Thailand under a 25-year power purchase agreement.

The plant will feature four M701F gas turbines, two steam turbines and six generators.

Vestas scores Tasmania deal

Australian utility Hydro Tasmania has placed an order with Vestas Wind Systems for the supply of 56 wind turbines for the Musselroe wind farm in Tasmania.

The order scope includes the supply, installation and commissioning of the V90-3.0 MW wind turbines, as well as a control system and a ten-year service agreement. The wind turbines will be manufactured during 2012 prior to installation on site during the first half of 2013.

JNPC awards Tianwan I&C contracts

A consortium led by Areva is to deliver the digital safety and complementary operational instrumentation & control (I&C) systems for the Tianwan 3 and 4 VVER 1000 MW class nuclear reactors in China.

The contract was awarded by Chinese utility JNPC (Jiangsu Nuclear Power Corporation), a subsidiary of China National Nuclear Corporation (CNNC), which will start building the two power plants in 2012. Areva will supply its Teleperm XS digital I&C system to the project.

Siemens bags Tuaspring order

Hyflux Ltd. has placed an order with Siemens for the supply a new combined cycle power plant in Singapore.

The 411 MW power plant will form part of the Tuaspring seawater desalination facility, which is scheduled to go online in 2014. The power block will be built in a single-shaft configuration and will be integrated into the desalination plant.

Siemens' scope of supply will include a Model SGT5-4000F gas turbine, the heat recovery steam generator, one SST5-3000 steam turbine, an SGen5-2000H-series hydrogen-cooled generator and the SPPA-T3000 instrumentation and control system as well as the associated auxiliary and ancillary systems.

Powergrid builds stronger grid

ABB has won an order worth about \$38 million from Powergrid Corporation of India Ltd. to supply equipment for the Champa transmission substation in the central Indian state of Chhattisgarh.

The Champa substation will be a pooling station receiving power at 765 and 400 kV and is part of Powergrid's plan to build a stronger national grid in India.

ABB's scope includes the design, engineering, supply, installation and commissioning of the 765 kV and 400 kV switchyards, including civil works. Key equipment to be supplied include circuit breakers, current transformers, capacitive voltage transformers, surge arrestors and protection, control and relay panels.

Europe

Stena orders Vestas units

Stena Renewable has placed an order with Vestas Wind Systems for 32 wind turbine units for a project in Lemnhult, Sweden.

Vestas will deliver and install its V112-3.0 MW wind turbine at the project, which is scheduled for completion in April 2013. The Danish company says that the order is a "significant stepping stone" in the development of Sweden's renewable energy market.

Siemens wins order for Amrumbank West

Amrumbank West GmbH, a subsidiary of E.ON AG, has placed an order with Siemens for the supply of wind turbines for its offshore project in the North Sea.

Siemens will supply 80 of its 3.6 MW turbines for the 288 MW Amrumbank West project. It says that the order solidified its position as the leading supplier of offshore wind turbines in Germany.

The Amrumbank West offshore wind park site is around 35 km north of the island of Helgoland and 37 km west of the island of Amrum. Siemens will deliver, install, and commission the wind turbines, and handle maintenance for an initial period of five years.

Helgoland will serve as the service base, and the turbines will be installed over an area of 32 km² at a water depth of around 25 m.

Midtjøllet Vindkraft orders Nordex units

Nordex says that its business in Scandinavia is continuing to grow with an order from Midtjøllet Vindkraft for the delivery and installation of 21 of its N90/2500 wind turbines.

The 52.5 MW Midtjøllet wind farm is owned by utility Østfold Energi, local utility Fitjar Kraftlag and the independent power producer (IPP) Vardar and will be built on the Norwegian island of Stord. Installation will start in 2012, with completion scheduled for 2013.

EDF chooses Areva for upgrade

French utility EDF has awarded Areva a contract worth over €600 million to upgrade the control systems of its 1300 MW nuclear power plants.

The contract is a key part of EDF's plan to enhance the operation and performance of its nuclear fleet. Areva's work will start in 2015, coinciding with major planned outages at the plants.

International

Flare gas expands Russian plant

GE says it is helping a power plant in Russia to demonstrate how flare gas can be effectively used to generate affordable electricity. The US firm is supplying a 109FA combined cycle plant for an expansion project at the

Nizhnevartovsk State Regional Power Plant. The plant will operate on natural gas generated by a gas processing plant using associated petroleum gas that otherwise would be wasted by burning or flaring.

The GE equipment, including a Frame 9FA gas turbine, a 109D-12 steam turbine and associated generators, has been shipped to the project site and installation has started. Commercial operation is planned by December of 2012.

The Russian government has set a target of using 95 per cent of the country's flare gas by 2012.

Scatec wins South Africa IPP

Scatec Solar is to build a 75 MW solar power project in South Africa after being selected as a preferred bidder in the first round of the South African Renewable Energy Independent Power Producer (IPP) Programme.

The €200 million project will cover an area of 105 ha in Kalkbult in the northern Cape region. It will generate over 145 GWh of energy per year, which will be sold to Eskom through a 20-year power purchase agreement.

Other companies that were successful in the bidding include Vestas, which will supply wind turbines to two projects, and Nordex, which will supply the wind turbines for the Dorper and Kouga wind farms.

Iraq boosts generating capacity

Alstom has signed a contract with the government of Iraq for the construction of a 728 MW gas fired power plant located in the Diyala Governorate, northeast of Baghdad.

Under the €400 million turnkey contract, Alstom will design and build the Al Mansuriya plant, which will consist of four units based on Alstom's GT13E2 gas turbine technology.

The plant will add generation capacity to Iraq's network by providing enough electricity to the Diyala Governorate and a part of Baghdad, located 80 km away from the plant. The first unit is scheduled to be operational in early 2013.

SEC, GE sign contracts

GE has signed contracts worth a total of almost \$300 million with the Saudi Electricity Company (SEC) to supply 13 gas turbines for the expansion of six power plants in Saudi Arabia.

The power plant expansions will add almost 800 MW of capacity to the Saudi grid by the summer of 2013 and are an important part of SEC's plans to reduce the risk of blackouts, particularly in summer months. GE will supply 13 Frame 7EA gas turbines and associated generators, as well as technical advisory services and performance testing.

"The expansion projects are part of our overall strategy to add an average of 4000 MW of power annually to the grid in Saudi Arabia," said Eng. Ali Saleh Al Barrak, president and CEO of SEC.

Poland plans new coal plant

Elektrownia Rybnik S.A. (ERSA) of Poland has awarded Alstom a €900 million contract to supply power generation equipment for a new 900 MW supercritical coal fired power plant at Rybnik.

Alstom will supply the new plant's boiler, coal milling system, steam turbine, generator and balance of plant. Commercial operation is scheduled for 2017. The contract will be executed in two phases. The first covers pre-engineering and support to ERSA during the permitting process. The second will be effective after the full notice to proceed expected mid 2013.



In safe hands

Michael Suess has been the head of Siemens Energy for nine months.

TEI Times speaks to the hands-on CEO about his new role and where he is taking the company.

As the relatively new CEO of Siemens Energy, Michael Suess no doubt has his hands full. But although it's a demanding job he still makes sure he finds time for his family – his wife, four children and the family dog.

“As we live in Starnberg on the lake we get involved in water sports during the summer and go skiing together in the winter. We regularly combine vacations with visits to historic sites as we are interested in history,” he says.

Suess also has a passion for cars, which no doubt went hand in-hand with his early career choices. He started his professional career with BMW, working there for eight years in several positions. After a short spell in Italy he joined Porsche where he headed the engine manufacturing sector. He then joined the management board at Mössner AG, a leading company in light-metal die-casting and in 2001 became a member of the managing board at the jet engine manufacturer MTU Aero Engines.

His move to Siemens came five years later, when in 2006 he joined the executive management of Siemens Power Generation and later took the role of CEO of the Fossil Power Generation Division in 2008. In April 2011 he assumed his current position as member of the management board of Siemens and CEO of the Energy Sector.

It is a big job but one that Suess finds attractive for a number of reasons. “I manage a sector with more than 80 000 employees globally. That is the figure I regard as the most impressive one, not revenues or profit. Every employee counts, and that's not only mandatory management talk,” Suess stresses.

“Furthermore, I like the pioneering spirit at Siemens. Our company is accustomed to invention, and innovation is driving change and improvement. That's a perfect environment for a shaper like me.”

The ability to shape and form is a quality that is essential for any management position and Suess is fascinated by the possibility of getting personally involved in permanently shaping the energy landscape by providing affordable and sustainable technologies for what he calls the new electricity age.

It is clear from Suess' manner that his management style is very open, direct and very hands-on. “When I do things, I do them with passion and see myself as a team player who not only talks about solutions to problems but also implements them vigorously.”

Certainly vigorous targets have been set for the coming three to five years. Siemens plans to boost its revenues to €100 billion in the mid-term. With 45 per cent, the Energy Sector will contribute the largest part of the additional revenues.

Hitting these targets will not be without its challenges and many will be watching to see how Suess and his sector perform.

Siemens, will not only have to beat off its competition, it will also have to adapt to a changing market.

Suess explains: “In the next 20 years, energy will be among the hot topics in industry. That attracts competitors, too; so we have to deal with increased competition and drastically changing market conditions. The system is becoming more and more complex and that's what the energy sector has to adapt to.

“Just to give you an example, 20 years ago there were only about 1000 power plants feeding into the German power grid. Nowadays there are about one million feed-in points when you take

into account the enormous amount of rooftop photovoltaic panels. As radical as the environment changed for the distribution grid, the market situation for the whole energy industry is changing. You will need more reserve generation capacity to buffer fluctuating in-feed. Efficiency is becoming more important as prices for fossil fuels increase as oil peaks. At the same time, countries such as Germany have abandoned their nuclear strategy. So it's not a case of dealing with evolutionary change; the task is to adapt to a radical system revolution. These are challenges I want to master with the backing of my employees and the strength of the whole company.”

Certainly there will be plenty of opportunity for Siemens to hit its business goals going forward. Global installed generating capacity will double in the next 20 years. This will allow it to grow both its fossil power generation and renewables businesses. The growth of the latter will drive demand for backup generation capacity, which will increase the need for highly efficient and very flexible combined cycle power plants. Suess therefore sees gas turbines as a clear growth area.

He also believes high-voltage direct current (HVDC) technology will experience a boom. “As market leader we obviously will benefit from that. And of course we also see good perspectives for our oil and gas business as high oil prices are driving exploration activities.”

But one area the company is pulling back from is nuclear. Nuclear power was once seen as a key technology in the fight against climate change. However, Fukushima was a stark reminder of the risk associated with the technology and Germany responded by revamping its energy policy. That changed things for Siemens, which decided to permanently withdraw from the business.

The company will continue to take part in the industry but will limit itself to providing conventional components such as steam turbines that are also used in thermal power plant. Suess believes its withdrawal from nuclear will make little difference to the company.

He says: “Our exit from nuclear has no financial impact as we were not active in the nuclear field. We just decided not to re-enter it. National energy policies will determine how the nuclear market develops globally. But as it will in any case be a smaller part

“The system is becoming more and more complex and that's what the energy sector has to adapt to”

of the overall energy mix, Siemens can afford not to take part in this field.”

Another technology aimed at cutting CO₂ emissions that Siemens will continue to pursue is carbon capture and storage (CCS). Siemens believes all three CO₂ capture technologies (pre-combustion, post-combustion and oxyfuel combustion) could be competitive once successfully demonstrated, but notes that promotion of public acceptance is a key topic and cannot be done by industry alone. It also acknowledges that large scale demonstration with the help of substantial public funding is crucial for the deployment of CCS.

Notably, the company was recently invited to take part in the technology qualification for the CCS project at Mongstad, Norway.

Commenting on the selection, Suess says: “We are proud that our PostCap

Technology has qualified for the important and highly ambitious technology qualification programme for full-scale CO₂ capture at Mongstad. In the first step we will demonstrate that our technology can be scaled up; in the second step we will focus on the demonstration to show that the process will work and that the emissions will be within the specified criteria. The third and final step will be the concept phase for design of full scale CO₂

Denmark.

Particular importance will also be attached to regionalisation in order to “enhance customer intimacy”. Siemens will therefore in the future be conducting its wind energy business below division level from three regional business units located in the US, Asia and Europe.

In addition to innovation and industrialisation, internationalisation of the manufacturing and marketing and



Michael Suess: adapting to a changing market

capture. Successful results in the technology qualification programme will allow for a selection of technology at Mongstad in 2014.”

Siemens recognises the impact that the drive to reduce CO₂ emissions will have on the energy landscape and has been reorganising itself accordingly.

Regarding the renewables business, Siemens is gearing up for further growth. It has realigned the business into the two independent units Wind Power and Solar & Hydro to establish the basis for further growth.

“We separated solar and wind power because these two markets are at very different stages of development. In Solar and Hydro we'll be moving forward with research and development in the field of solar power to further increase our competitiveness. This unit also handles the strategic issue of power

sales network will play a key role in Siemens' strategy. The company just announced two new wind joint ventures in China—a breakthrough in the world's most important wind power market. With these joint ventures Siemens says it is optimally positioned to participate in this strong market.

Internationalisation in the wind business will continue. Today Siemens has seven facilities in three countries. In three years time, it plans to have 12 production facilities in eight countries.

Suess says: “With the new setup we want to ensure that we continue the success story with our wind power business in the future. The starting position for that is good. We've got an order backlog of approximately €11 billion and we're world market leader in offshore wind farms, the market sector posting the fastest growth. We also want to forge ahead with onshore wind turbines in order to become a leading player in the wind power market.”

Siemens' reorganisation for the new energy landscape does not stop at generation. Smart Grids, essential for the optimum operation of the future energy system, has been moved into a division called Infrastructure and cities.

Suess explains: “The corporate decision to bundle all of Siemens' business activities relative to infrastructure and cities within the new Sector means that we moved our power distribution business from Energy to the new Sector. However, it does not mean that we lost this division. Just as we are strengthening the cooperation between our divisions, we are increasingly presenting ourselves to customers in a way so that they can be offered a wider range of products and solutions out of one hand.”

And it is a ‘hand’ that looks set to get bigger in the safe hands of Suess and his employees.

Oil

Opec lifts crude production target

■ IEA welcomes Opec "commitment to making ample supplies available" to the market

David Gregory

Opec ministers gathering in Vienna on 14 December agreed to iron out differences and set a new production target of 30 million b/d, although current production is near 30.9 million b/d. The ministers did not attempt to work out separate production quotas for each member country. In effect this leaves Opec members to produce as they wish, which means that most will be producing at full capacity.

Only the Gulf states – notably Saudi Arabia, but also the UAE and Kuwait – possess the capacity to adjust production. Saudi Arabia and the other Gulf producers have promised to increase output, if necessary, to "ensure market balance and reasonable price levels," the communiqué issued by Opec at the end of the meeting said.

Libyan crude oil production, which is now estimated as high as 1 million b/d, may come back to its usual

1.6 million b/d in 2012. Meanwhile production from Iraq could also move towards 3 million b/d. As output from those members begins to expand, Saudi Arabia and other states that boosted output to make up for the lack of crude on the market during the Libyan civil war, will be expected to cut back.

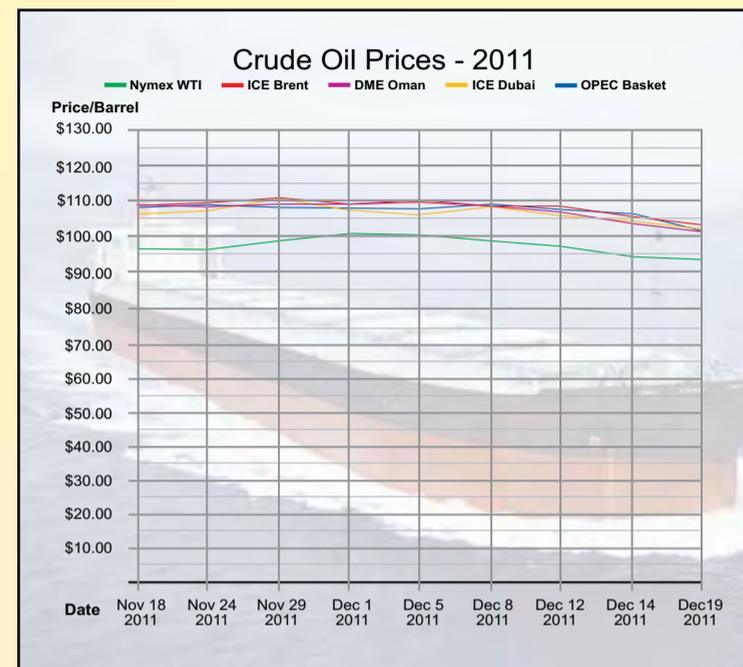
The Paris-based International Energy Agency (IEA) welcomed Opec's decision, saying in a statement that it welcomed "Opec's expressed commitment to making ample supplies available to the market." In its latest *Oil Market Report (OMR)*, the IEA forecast that demand for Opec crude would average 30.2 million b/d.

Concern over the eurozone debt crisis and the lack of a recognisable economic recovery in the US has kept the price of Dated Brent crude at an average of around \$110/b during the fourth quarter. Should Europe and the US move back into recession and demand slip further in China, crude

prices could begin to fall. What action Opec members would take in such a scenario remains to be seen, but the Vienna deal supposes that Gulf producers would be expected by other members to cut output in order to maintain prices at around \$100/b, an event that could undermine demand further.

The IEA, in its December *OMR*, reduced its growth demand forecast by 200 000 b/d for both 2011 and 2012, based on a "precarious economic backdrop" and weaker data in the fourth quarter of this year – especially of the OECD. "Global demand is expected to average 89.0 million b/d in 2011, a rise of 700 000 b/d on 2010, before gaining a further 1.3 million b/d in 2012 to reach 90.3 million b/d," the report said.

Non-Opec crude supply averages 52.7 million b/d in 2011 and 53.7 million b/d in 2012, according to the IEA forecast. It added that Opec crude oil supply rose in November to the



highest level in more than three years to 30.7 million b/d. Saudi Arabia and Libya accounted for most of this increase for the month.

Meanwhile, the IEA report included medium-term projections that show global oil demand rising from 88.3 million b/d in 2010 to 95.0 million b/d in 2016, an average annual growth of 1.1 million b/d.

The report commented that "the magnitude of supply side challenges" had been amply demonstrated in 2011 through the loss of crude supply from Libya as well as unplanned non-Opec stoppages. It warned that a "deteriorating geopolitical and supply-side backdrop hangs over Syria, Yemen and Sudan, even if ultimately supply disruptions there might be short-lived." It also pointed out that "the spectre of an embargo on Iranian oil exports has also emerged, and although precise market reaction is difficult to predict, added tension on the supply side are likely to have a

bullish impact."

However, the new Opec deal could mean that if other shortages appear in the market as they did with Libya, the Gulf producers would be at liberty to boost output in order to avoid price spikes.

At more than \$100/b, crude prices are not helping the global economic recovery, but crude producers are giving priority to their domestic concerns first.

In Opec's latest *Monthly Oil Market Report (MOMR)*, the group reported that the Opec reference basket settled above the \$110/b mark for the first time since July 2011. It noted that West Texas Intermediate (WTI) "jumped by \$10.73/b to average \$97.16/b for the month, while ICE Brent rose \$1.70/b to average \$110.49/b. WTI was up by 15.2 per cent year-on-year and ICE Brent 28.2 per cent higher than a year ago. On 12 December, the Opec reference basket stood at \$107.33/b," the report said.

Gas

Israel prepares for regional role as gas producer

Mark Goetz

Israel's gas reserves now exceed 700 billion m³ (bcm) as the result of drilling carried out by the American firm Noble Energy. The Israeli government is currently debating what the country's gas policy should be: the question being how much gas should be held as long-term reserves and how much might be made available for export? The deepwater drilling carried out by Houston-based Noble indicates that there are significant gas – and possibly crude oil – deposits lying off the Levantine coast.

The US Geological Survey has stated that there is as much as 122 trillion ft³ (tcf) of natural gas and more than 1 billion barrels of crude to be discovered in the Levant Basin, which lies in the swath of the southeast Mediterranean Sea stretching from southern Syria to Egypt's Nile Basin and into the waters

south of the island of Cyprus.

Noble Energy last month increased the volume of gas reserves in the offshore Leviathan field to 17 tcf (481 bcm) following the results of the Leviathan-3 well appraisal drilling.

The Leviathan field was discovered in December 2010 with reserves of 16 tcf. That followed the discovery of the offshore Tamar field, where reserves are put at 9 tcf.

In a statement announcing the Leviathan-3 results, Noble's chairman and CEO, Charles D. Davidson said: "The results of the appraisal well are very encouraging and validate our seismic modelling and petro-physical interpretation of this substantial resource."

This positive outcome has led to an increased gross mean resource estimate of 17 tcf with a range of 14 to 20 tcf. We already have project teams in place identifying commercialisation

options and screening field development concepts."

Noble and its Israeli partners – the main one being the conglomerate Delek Group, whose subsidiaries Delek Drilling and Avner Oil and Gas hold shares in Leviathan, Tamar and other licenses with Noble – are looking into what options exist to monetise the gas discoveries, especially with regard to export.

A major project would be the construction in Cyprus of a 15 million tons/year LNG facility. Noble and Delek have proposed the idea to the Cypriot government.

Such a facility would process and export gas from Israel's Leviathan field and also any natural gas that Noble finds in Cyprus's offshore Block 12, where drilling was scheduled to finish by end December. Noble holds a 100 per cent stake in Block 12 and the Cypriot government has recently approved an application by Noble to

The recent gas discoveries offshore Israel have put the Mediterranean country in a position where it will not only be able to meet its own future demand for natural gas, but also is seeing the possibility of exporting gas in the form of LNG.

transfer 30 per cent of that stake to Delek.

In November Noble and Delek also said they were giving consideration to floating offshore LNG production for the Tamar gas field. Prior to this announcement, it had been thought that the Tamar gas field would be held in reserve to meet Israel's current and future domestic demands.

Tamar is set to begin delivering gas to Israel via the Mari-B platform and the existing infrastructure to Ashkelon in 2013.

The halt in gas supplies to Israel from Egypt due to the repeated bombing of Egyptian gas pipeline infrastructure in the Sinai will leave Israel with a serious gas supply shortage starting in 2012, when gas from the Mari-B field expires.

Meanwhile, development of Tamar is being hurried along and an offshore LNG regasification terminal is being

arranged offshore Hadera.

The Israel Electric Corporation (IEC) announced last month that it had approved an \$8 billion agreement to purchase Tamar natural gas. The agreement is for a 15-year period and covers delivery of 3 bcm per year beginning in 2013 once the field comes on-stream. It is estimated that IEC will pay between \$5.20-5.30 per million Btu. This will be subject to revision however if the Tamar consortium signs subsequent deals with other companies that put the price at a lower cost, or the Israeli government imposes controls on the price of natural gas.

The agreement also gives IEC the option to purchase an additional 2 bcm/year once more gas supply infrastructure comes into operation in 2015. As gas demand in Israel is expected to rise in relation to its availability, there is a strong chance that IEC will exercise this option.

Unleashing the power of UCG

The use of coal for power generation has come under increasing pressure in recent years but underground coal gasification could change the picture. **Junior Isles**

Not all are convinced by the current belief that Europe's future power needs can be met predominantly by renewables with gas as the main transition fuel along the way. While many are predicting the end of coal, there are some who still believe there is potential to use the vast coal deposits for power generation – even if not through burning directly in power stations.

Commenting on Europe and more specifically the UK's fuel strategy, Paul Younger, a Professor at Newcastle University in the UK and a Director at Five-Quarter said: "Some people are talking about reaching ludicrous scales of renewables; 80 per cent by 2050 but there is a question as to whether renewables can sustain society at all. Meanwhile, gas has a few problems of its own, especially regarding the reliance on imported gas. There is also a big ethical problem with regards to imported coal, which no one wants to talk about. The UK still has some 74-75 per cent of its coal still in the ground."

Professor Younger believes the UK is sitting on resources of coal that could still be put to good use despite the current political climate surrounding the use of coal as a fuel resource for power generation.

Long after its gas and oil reserves have been exhausted, the UK will still have large onshore and offshore coal reserves, though most of these are beyond the reach of conventional mining techniques. Underground coal gasification (UCG) opens up the prospect of accessing trillions of tonnes of otherwise "unmineable" coal.

Younger said: "We have done a study on the northeast region on the availability of coal resources. We now have a license awarded to us by the Coal Authority. The 400 km² area represents just a small fraction of the coal in the northeast of England, much less the whole of Britain. But just that 400 km² patch has the equivalent energy of 75 per cent of all the gas that has ever been produced from the North Sea. When people wake up to these facts, this energy will not stay in the ground when the lights are off."

Younger stresses the importance, however, of extracting that energy responsibly in a way that it can be used as a CO₂ store. When combined with carbon capture and storage (CCS), UCG offers some attractive new low-carbon solutions on a vast scale.

Dermot Roddy, also a professor at



Linc Energy's GTL demonstration plant. Photo courtesy of Linc Energy

Newcastle University and Director at Five-Quarter said: "Most people in the world will say there is about 0.5 trillion tonnes of coal reserves in the world but that's because they only count the coal they believe is commercially viable to mine. The figure is actually 18 trillion tonnes. Mining a large proportion of the remainder is considered environmentally disruptive but if it can be done safely with CCS it becomes viable."

And Younger has no doubt it can: "If anyone says underground gas storage cannot be done, we've been doing it for 60 years up in the north of England."

UCG is a technique first pioneered in the UK in 1912 by Sir William Ramsey, who also discovered the noble gases. The first experiment was set up in County Durham in the north of England.

It is based on boreholes, where there is an injection borehole and a production borehole. Steam and oxygen is injected down one borehole to turn the coal into a synthetic gas (mainly H₂ and CO) that still has 80 per cent of the calorific value of the original coal. The gas is then fed up the production borehole to a pre-combustion separation unit before use for manufacturing petrochemicals and liquid fuels, substitute natural gas or hydrogen for power generation from gas turbines or fuel cells.

While the technology may have been pioneered in the UK a century ago, it is Australia that is now perhaps at the forefront of UCG development.

Australian energy company Linc Energy first began UCG trial operations in 1999 near Chinchilla, a rural community about 300 km west of Brisbane, Queensland. Since that time, Linc Energy has further developed the site through the construction of four additional UCG fields, a large demonstration Gas-to-Liquids (GTL) facility, and a world-class research laboratory.

According to Linc Energy it is the only facility of its kind in the world, providing a research and development capability in preparation for the commercialisation of both UCG to GTL and UCG to power technologies in locations in Australia, UK, Europe, the US and other locations around the world.

Linc Energy has been using the facility to develop a fundamental understanding of the gasification process. The company has invested in the development of a series of proprietary software models to predict and control the process and to maximise gasifier performance. This has included models for site selection, groundwater flow and monitoring, sub-surface subsidence, cavity growth and syngas quality.

The first gasifier at Chinchilla ran between January 2000 and April 2002 and provided stable syngas production and composition suitable for power generation. Gasifier 1 demonstrated the linked vertical well concept and effective gasifier shutdown and decommissioning. Most recently, Linc Energy started up its fifth generation

gasifier, specifically tailored to support the commercial roll out of UCG. Gasifier 5 incorporates state-of-the-art oil and gas technology into the design, including use of directionally drilled horizontal wells for increased energy recovery and high temperature well designs and completions.

Although GTL is currently the application with most added-value for UCG, Linc Energy expects power generation from UCG to be a viable commercial business, particularly in regions that currently experience severe power shortages or have few alternative resources for producing electricity. Linc Energy's majority owned Yerstigaz UCG project in Uzbekistan has been providing syngas to a local power generator for over 50 years demonstrating the potential of this model.

While efficiency estimates are sensitive to site factors, Linc Energy says that the efficiency of a combined cycle gas turbine-UCG plant (without CCS) is comparable to a surface integrated gasification combined cycle (IGCC) power plant. Linc Energy's cost estimates conclude that UCG-CCGT without any CCS would deliver power at costs lower than surface based IGCC and comparable to conventional pulverised coal plants.

Peter Bond, Linc Energy's CEO said: "Recent cost estimates reveal that the total electricity cost of UCG would be around 30 per cent cheaper than from a conventional IGCC plant. We believe UCG can be a serious player in the power generation mix."

Notably, Chinchilla is an important facility in the ongoing development of alkaline fuel cells; the facility was the first in the world to successfully run an alkaline hydrogen fuel cell on hydrogen derived from syngas produced from UCG. Linc Energy partnered with UK company AFC Energy on the project. Trials on an 'alpha system' delivered encouraging and higher than expected voltages, which showed that hydrogen fuel cells could be utilised with syngas without separation.

Future plans could see continued trials with a beta system as well as setting up a CCGT facility. As Bond summed up: "Our Queensland demonstration facility is the only place in the world where this unique and remarkable UCG to GTL process has been achieved. With significant coal deposits suitable for UCG technology, Linc Energy can potentially provide alternative sources of liquid fuels, synthetic natural gas and power for future generations."

Alkaline fuel cells inch towards commercialisation

An alkaline fuel cell (AFC) converts oxygen (from the air) and hydrogen (from a supply) into electrical energy, water and heat. It is chemically comparable to a battery that will provide electric power continuously, as long as it is fed with the hydrogen and air. An alkaline fuel cell is one of the very few zero emission devices capable of being scaled up to deliver megawatt sized power production capacity.

The AFC Energy alkaline fuel cell has the highest electrochemical efficiency of all types of fuel cell systems – around 60 per cent electrical efficiency. Equally importantly it has a simple design that does not need to be operated under high pressure. AFC Energy's fuel cell operates at 70°C and just above ambient pressure, which enables the bulk of the components to be made from cheaper plastics resulting in reduced costs.

Since proving the concept with an alpha system, AFC Energy has been busy developing its scaled up beta system.

Howard White, AFC Founder noted: "The alpha system demonstrated everything, but we needed to move from a 3.5 kW system to larger systems. So there was the hurdle of how to move from this proof-of-concept to a commercial system."

A major modification in the technology has been the use of a metal substrate instead of a plastic one. Essentially, this allowed the size of each cell to be increased. Whereas the alpha system featured 4x 1 kW cartridges, in the beta system each cartridge has an expected output of 10 kW.

Cartridges, which will have an eventual 1-year life, have also been designed so that 80 per cent of the components can be reused and re-cycled. "This drives down the cost of our capex/opex model, which has been our focus," noted White.

With beta systems installed at industrial facilities, AFC Energy says it is on track to having a commercially available system.

Growing tide of renewables

Having achieved a major milestone in the operation of a 500 kW tidal stream turbine, Rolls-Royce believes it is on track to commercialisation of a 1 MW machine by 2020. **Junior Isles.**

Tidal stream generation – which uses the speed of tidal currents – represents an enormous opportunity, with 20-30 GW available globally according to industry estimates. But compared to wind and solar, its march towards commercialisation has been a slow one. Looking at the global picture, most progress has been made in the UK, which has the best wave and tidal resource in Europe.

At the end of October a significant milestone was reached in the development of the technology when a 500 kW tidal stream turbine deployed by Tidal Generation Ltd (TGL), a subsidiary of Rolls-Royce, fed more than 100 MWh of electrical power into the national grid.

With ambitions for 15 per cent of electricity consumption to be met by renewables by 2020, the UK is betting heavily on wind, particularly offshore wind.

But looking beyond this timeframe, it also believes there is significant potential to utilise its surrounding waters for tidal stream generation. Unlike wind and solar, tidal power is a predictable baseload source, making it an important part of the future renewable energy mix.

Commenting on the potential for tidal stream generation, Robert Stevenson, Vice President, Power Ventures, Rolls-Royce and CEO of TGL said: “For our type of device, which operates at a depth of about 40-80 m, we think it is about 23 GW worldwide, of which about 10 GW is in the UK. This could meet about 7-10 per cent of the UK’s electricity demand.”

According to Stevenson there could be 130-140 MW in the water by 2017 but he acknowledges it is still early



Rolls-Royce's 500 kW turbine can be deployed in 15 minutes

days for the industry. “There are no arrays in the water anywhere in the world; any devices installed are single prototype machines,” he said.

The TGL prototype tidal turbine currently deployed at the European Marine Energy Centre’s (EMEC) test site, 3 km offshore of the Orkney Islands in Scotland, is a three-bladed turbine with a rotor diameter of 16 m. The rotor, which operates at 14 rpm, is coupled to an epicyclic gearbox to increase the speed, then to an induction generator and power converter.

The turbine can generate from a water speed of 1 m/s. It achieves its rated 500 kW power output at a water speed of 2.7 m/s and is designed to operate a maximum water speed of 3.4 m/s.

A unique design feature is that the turbine uses a computer controlled yawing system so that it turns with the tide. Unlike the fixed designs, this allows the turbine to always point into the tide to optimise energy extraction.

The turbine is buoyant, which means it can be deployed in just 15 minutes – an important factor since installation has to be completed between tides. Installation involves towing the turbine to site using a small vessel, winching it down to the seabed with a remotely operated vehicle where it is fixed to a tripod on a foundation on the seabed.

The unit installed at the EMEC site has now been running for over a year and has generated more than 175 MWh, despite an extended outage period from January to July. Stevenson explained: “We have a strict process of install, generate, remove and inspect. On one of our inspections we found indications of stress. There was a problem with a component in the pitch system, which was basically under-designed. We had to design-out the problem, which meant machining and installing new parts. Now the machine is running 100 per cent of the time and will continue running until the middle of next year.”

So far, Rolls-Royce has invested £23.1 million in the development of the turbine, with another £3.6 million coming for the Energy Technology Institute (ETI). “The government is very excited by it and we have been lobbying for further funding to support R&D to move to the next stage,” said Stevenson.

The 500 kW unit was part of the DeepGen III programme, which focused on developing a turbine to be deployed at a depth of 40 m. This is now being followed by an ETI-sponsored project known as ReDAPT (Reliable Data Acquisition Platform for Tidal). Under this project, Rolls-Royce is currently building a 1 MW tidal stream turbine demonstration unit that will be deployed in mid-2012 at EMEC in Orkney.

The turbine will be tested for two years in order to provide data on turbine life, bio-fouling, corrosion and other information needed to help the industry move forward.

Commenting on the task of doubling the turbine output, Stevenson said: “The 500 kW device proved the physics works – that we can extract energy from the sea reliably. Now we have to extract it in volume and at a performance that is acceptable to move towards a commercial offering.”

The scale-up calls for an increase in the turbine dimensions. While it will have the same design as the 500 kW machine, rotor size will be increased to 18 m. The turbine will be 21 m in length, 2.6-3.5 m wide and 5 m high. This will see its weight increase from 100 t for the 500 kW unit to 170 t.

While the 1 MW will sit on the existing support structure, going forward Rolls-Royce is designing a new foundation. This will help with the cost of deployment, cost of construction and deal with some of the problems caused by uneven conditions of the seabed. This concrete foundation will be drilled and fixed to the seabed, much like an offshore oil platform. According to Rolls-Royce, this arrangement allows a significant overall weight reduction. “Other manufacturers use free-standing designs which have a typical gravity base of 1200 t,” noted Stevenson.

Rolls-Royce has charted a technology roadmap aimed at having a commercial product ready by 2020. It is in talks with four developers about arrays ranging from 10 MW up to about 160 MW. The first 10 MW array is expected to be operational by 2013/14. These will use 1 MW machines, which Rolls-Royce believes is about the right size when considering cost versus performance.

Stevenson noted: “We genuinely believe this will be a commercial

business from 2020 but the time between now and then is crucial in demonstrating array behaviour, which is different from single turbine behaviour. Putting other things in the water will affect its flow, much like a windfarm. There will be turbulence effects.”

Other areas of focus are: electrical infrastructure i.e. how to electrically connect multiple turbines together; how they will perform in groups; and how to physically install a large number.

TGL is also looking at where it can reduce costs and improve reliability. “Tidal is all about kilowatt-hours and you get that from the capacity of the machine, its reliability, and the flow of the water. It’s no good having a 10 MW machine if it only generates 10 MW on one day a year, or a 5 MW machine that’s only 50 per cent reliable; it’s a combination of all three,” said Stevenson.

With installed costs currently running at about £6 million/MW and about 26 pence/kWh (£260/MWh) on a through-life basis, it is a technology that is in need of strong support. The UK government is therefore supporting it through Renewable Obligation Certificates (ROCs). Under the recently announced Renewables Obligation banding review, tidal technologies in the UK will receive five ROCs for projects up to 30 MWe in capacity until 2017, this is a major step in moving the technology towards commercialisation Stevenson said and a much welcomed announcement. Couple with targeted R&D support there is real potential to move the industry forward.

However Stevenson is confident costs will come down as they have with wind and that with the right level of support, the industry is on the right track.

He concluded: “The latest number for offshore wind in the UK’s Round 3 and 4 programmes is estimated at 19 pence/kWh. In terms of the current Round 2 programme, we believe we can be price competitive by around 2021. We are on a commercialisation track. We’ve shown we can deliver; we now have to show that we can scale up and commercialise. But we can’t do it on our own. We need help from government and partners. There are still several pieces of the puzzle to fit in place but the sector has a lot of promise.”



The tidal stream generator is supported on a tripod structure



Junior Isles

Durban deal is no thriller

Last month the 194 parties to the United Nations Framework Convention on Climate Change (UNFCCC) agreed on a package of decisions, known as the Durban Platform, which includes: a second commitment period for the existing Kyoto Protocol; the launch of a new protocol or legal instrument that would apply to all members following the expiry of Kyoto; and the launch of the Green Climate Fund.

Negotiators at the COP17 climate talks in South Africa seemed pleased with their efforts but in truth there was not much to be thrilled about. Yes, the Durban Platform keeps talks alive but not much more. Certainly it will do little to address the core problem – cutting emissions of greenhouse gases enough to stave off dangerous levels of global warming.

As Alden Meyer, of the Washington-based Union of Concerned Scientists put it: “We avoided a train wreck and we got some useful incremental decisions. The bad news is that we did very little here to affect the emissions curve which is accelerating, and the impacts of climate change which are climbing day-by-day.”

The Durban meeting at least managed to secure a second commitment period under the existing Kyoto Protocol, with 35 industrialised countries agreeing to take on further targets from 2013, once the first commitment period lapses next year.

Pleased with the outcome, UN climate chief Christiana Figueres said: “This is highly significant because the Kyoto Protocol’s accounting rules, mechanisms and markets all remain in action as effective tools to leverage global climate action and as models to inform future agreements.”

Yet even the agreement to extend

Kyoto is one of compromise. Henry Derwent, president of the International Emissions Trading Association said the deal for a second commitment period is effectively a “Kyotino”, with so few parties taking part, “something which a few EU officials said not too long ago they would reject”.

Canada’s environment minister Peter Kent announced that Canada would withdraw from the Kyoto Protocol, saying it would save Canada \$14 billion in penalties for not achieving its Kyoto targets. He noted that it would allow the country to continue to create jobs and growth in Canada without the burden of reducing emissions.

“We are going to have a very tough three or four years of negotiations if we are going to get all those countries to sign and ratify a treaty”

Canada and the United States, which did not sign the Kyoto pact, have criticised the accord for leaving out some of the world’s largest emitters.

“The Kyoto Protocol does not cover the world’s largest two emitters, United States and China, and therefore cannot work,” Kent said. “It’s now clear that Kyoto is not the path forward to a global solution to climate change. If anything it’s an impediment.”

Negotiators in Durban also failed to decide if the new commitment period will run until 2017 or 2020 and it remains unclear as to what emission reduction targets participating countries would be willing to take.

Jonathan Grant, a London-based climate and energy policy specialist at consultancy PwC said the targets in the Kyoto agreement “are no different from what they were when we went in [to the negotiations].”

“There’s still uncertainty about whether the EU will move to 30 per cent,” he said, referring to the EU’s statement that it would increase its 2020 reduction target from the current 20 per cent below 1990 levels to 30 per cent, if others made comparable efforts. He also said there is uncertainty about Australia and New Zealand’s commitments.

“Some people talked about this being a clear signal – these are not clear signals,” Grant said, noting the extensive conditionality in the text for a second commitment period under the Kyoto Protocol.

Connie Hedegaard, EU Climate

Commissioner, conceded that crucial details still had to be worked out. “This is a process and process is filled with compromises,” she said.

In terms of a successor to Kyoto and the introduction of a legally binding agreement, negotiators finally agreed to start work next year with a view to concluding a deal by 2015. The hope is that they will ultimately agree to a binding treaty for post-2020 that all countries will sign up to – developed and developing.

But even the nature of any such treaty remains vague and is likely to be a point of contention going forward. Negotiations had stalled on whether to call it “a protocol or legal instrument or an agreed outcome with legal force”. Karl Hood, foreign minister of Grenada and chair of an alliance of small islands commented: “It is going to be a fight [at future conferences] because going

forward you have to interpret ‘agreed outcome with legal force’ – what does that actually mean?”

The Durban Platform also agreed the launch of the Green Climate Fund (GCF). The parties agreed to make the fund, intended to help poorer nations combat the effects of climate change, operational. It will be the main recipient of \$100 billion, which wealthy countries have pledged to mobilise annually by 2020. Germany has pledged €40 million while Denmark has promised €15 million for the GCF’s “operationalisation”. However, longer-term funding mechanisms have to be worked out.

Other documents in the package lay out rules for monitoring and verifying emissions reductions, protecting forests, transferring clean technologies to developing countries and scores of technical issues.

Notably, carbon capture and storage (CCS) has been included in the UN-backed Clean Development Mechanism (CDM) carbon offsetting scheme, paving the way for developing countries to access finance for CCS projects.

According to the International Energy Agency, some 3400 CCS projects need to be up and running by 2050, many of them in the developing world. At the moment the vast majority of projects under development are in Europe, North America and Australia. The IEA indicates that CCS can deliver about a fifth of the required emission cuts by 2050 and can do so at a lower cost than if CCS is not deployed.

Nevertheless, many critics complain that the Durban Protocol lacks ambition. The agreement does not commit nations to ensuring their greenhouse gas emissions start to decrease before 2020, which scientists say is crucial to preventing global temperatures from rising more than 2°C above current levels.

Celine Charveriat of the anti-poverty group Oxfam called the Durban pact “a major disappointment”.

United Nations Environment Programme (UNEP) chief Achim Steiner said: “The core question of whether more than 190 nations can cooperate in order to peak and bring down emissions to the necessary level by 2020 remains open – it is a high-risk strategy for the planet and its people.”

Meanwhile, Meyer noted: “... we are going to have a very tough three or four years of negotiations if we are going to get all those countries, at the end of the day to sign and ratify a treaty.”

Like China, the US did not publicly oppose the final agreement, probably due to the ambiguity of the final wording. Todd Stern, leading the US climate envoy gave a measured response. “This is a very significant package. None of us likes everything in it. Believe me, there is plenty the United States is not thrilled about.” However he said that the package captured important advances that would be undone if it was rejected.

With negotiators ending two weeks of talks in the twilight hours of the final day of the conference, some must have felt like the walking dead at its conclusion. And as Stern noted, indeed it was hardly a thrilling conclusion. But in some ways, it has left us with a Michael Jackson type of ‘Thriller’, although not quite the dancing dead. The fight against climate change seems to be entering zombie status – not exactly alive and kicking but by no means dead either.

