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Crimea crisis puts focus on energy security

Political tension between Russia and the Ukraine over Crimea has spilled over into EU energy policy, pushing energy security to the top of the agenda. **Junior Isles**

Russia's annexation of Crimea has seen politicians turn their attention from climate change policy to security of supply.

Last month's European Council meeting was due to discuss the European Commission's proposals on 2030 climate and energy but instead the growing tensions between Russia and the Ukraine plus the rest of the EU, saw attention firmly focused on energy dependence.

The meeting saw EU leaders invite the Commission to propose by June, "specific interconnection objectives" for 2030. EU leaders also said they would examine how to facilitate gas exports from the US as part of a "comprehensive plan for the reduction of EU energy dependence".

The EU currently receives around a third of its gas from Russia. Global energy markets are watching the crisis in Ukraine closely and analysing implications to European natural gas and oil trade flows.

According to *Platts*, a leading global energy, metals and petrochemicals information provider, energy concerns would be greatly heightened if there were any escalation of events that would include Russia shutting down gas flows.

Under such a scenario, it said about 25 per cent of European natural gas supply would be missing and would need to be replaced by another source.

A statement from *Platts* said: "In such a case of missing supply it is likely the marketplace or policymakers could seek remedies to any wholesale shutdown of supplies by for example: maximisation of domestic production; higher competition on LNG, and maximisation of imports into Europe; consumption mitigation measures, including switching to fuel oil for power and industrial users."

Russia's Gazprom told an investor conference in London last month that it expects Europe to become even more dependent on its gas supplies in years to come because Europe's domestic production has fallen.

Some argue that development of a domestic European shale gas industry could decrease its dependency on imported gas as well as increase the bloc's economic competitiveness.

In a recent study published by Deloitte, the exploitation of natural gas could allow Spain to become completely independent of gas imports by 2030 and an exporter of natural gas until 2050.

The study, commissioned by the Spanish Oil & Gas Association, assesses the impact of the exploration and development of conventional and

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Climate and energy policy on the back burner

The European Council is not expected to decide on its 2030 climate change and energy policy before October.

In its conclusions at the end of the meeting on March 20-21, heads of state called on the Commission to present a plan that "should reflect the fact that the EU needs to accelerate further diversification of its energy supply, increase its bargaining power and energy efficiency, continue to develop renewables and other indigenous energy sources and coordinate the development of the infrastructure to support this diversification".

Heads of state asked for a decision by October. On industrial policy, the conclusions invite the Commission to prepare yet another roadmap.

Notably, however, there was no mention of the European Commission's proposal on climate policy. The Commission's proposed energy package calls for a binding target to reduce carbon emissions by 40 per cent from 1990 levels by 2030. It also includes replacing the existing 20 per cent renewable energy target for 2020. A 27 per cent goal for the EU as a whole with no individual national objectives has been proposed.

The issue of no national renewable targets was discussed in a ministerial debate in early March.

Germany called for EU state aid rules to allow governments to support renewables up to a higher share than the proposed 27 per cent EU target for 2030, but poorer EU countries are worried about being disadvantaged.

"If member states have more ambition and want to go further [on renewables targets], they should be allowed to do so," German economy and energy minister Sigmar Gabriel said during the debate.

Following the debate, 151 companies and organisations signed a declaration calling on EU heads of state and government to set an ambitious renewables target for 2030. The European Wind Energy Association said that a more ambitious 30 per cent target would create 568 000 more jobs and save on fossil fuel imports.

Energy price concerns also resonated through the debate. Greek Energy Minister Yannis Maniatis, whose country holds the EU rotating presidency through June, told reporters at the gathering: "We need to make sure we combine our objectives for setting ambitious goals with increasing competitiveness of the industry and safeguarding energy supply."

Gabriel said that energy intensive industry would need exemptions from "bearing the full burden" of renewable targets so as not to reduce their global competitiveness.

The European Parliament called on the Commission and EU countries, in its resolution adopted on March 5th by 341 votes to 263, with 26 abstentions, to set a 2030 EU target to reduce domestic greenhouse gas emissions by at least 40 per cent from 1990 levels. It also wants an energy efficiency target of 40 per cent, in line with research on the cost-effective potential, and a commitment to producing at least 30 per cent of total final energy consumption from renewable energy sources.

Continued from Page 1

and unconventional hydrocarbons, including shale gas, on gross domestic product, job creation and imports and exports.

Commenting on the report, Marcus Pepperell, spokesperson for Shale Gas Europe said: "Spain currently imports 99 per cent of its hydrocarbons. Shale gas could completely turn this around. This would result in increased energy security, and support growth and job creation in a challenging economic environment.

"The numbers highlighted by Deloitte for both oil and gas exploration and production are too significant to be overlooked but require further analysis for the country to realise its full potential. It is time for Spain and Europe to fully assess their indigenous shale gas resources through further exploratory drilling."

In March both Poland and the UK announced measures including tax allowances to promote shale gas exploration.

Some, however, believe moves to exploit shale gas is at odds with reducing carbon emissions and say Europe's leaders should see the situation with Russia as an opportunity to link climate and energy policy with energy independence.

The European Wind Energy Association (EWEA) said a 30 per cent renewables target for 2030 would cut Europe's reliance on gas imports by almost three times as much as the European Commission's proposal for 27 per cent, the Commission's own figures show.

EWEA's CEO Thomas Becker said that a renewable energy target of at least 30 per cent would allow Europe to "significantly scale back" its fossil fuel imports.

After a letter to Europe's leaders, Becker said: "The situation in the Crimea is a wake-up call: Europeans rely on the most unstable and volatile parts of the world for energy security. For each new fossil fuel fired plant we build, we commit to buying the fuel abroad for years to come without security.

"Each European is sending €2 net per day to sources outside of the EU. Let us stop creating wealth for the already wealthy in Russia, Qatar and Saudi Arabia. Instead let us invest in wind and renewables – European energy sources which do not have to be imported, which will not run out."

Stefan Scheuer, Secretary General

Scheuer pointed to weakness in proposals on energy efficiency

of the Coalition for Energy Savings, which includes NGOs and businesses said that 40 per cent of end-use energy savings by 2030, as requested by the European Parliament, could cut gas consumption to amounts at least equivalent to imports from Russia.

"The weakness of the Commission's 2030 proposals on energy efficiency and thus on energy security has been exposed," he said.

Competition probe could lead to UK shake-up

In an effort to address concerns surrounding rising energy bills and rebuild consumer trust, Ofgem has ordered a probe into the UK's large energy suppliers. Some say the investigation could lead to a break-up of the 'big six' and threaten investment. **Junior Isles**

An investigation ordered by UK regulator Ofgem into the UK energy market could lead to a massive shake-up of the energy industry, possibly forcing the break-up of the 'big six' energy suppliers.

The investigation to be carried out by the Competition and Markets Authority (CMA) is in an attempt to restore trust in a sector that has lost the confidence of consumers.

Ofgem said the probe would determine whether vertical integration was in consumers' interests or whether there should be more separation between the large energy companies' supply businesses and their power generation units. A final formal decision on the inquiry is expected in July.

The competition inquiry was ordered after Ofgem conducted an assessment of the market, which showed the big energy companies' retail profits had more than quadrupled in three years, from £233 million ($372 million) in 2009 to £1.1 billion in 2012.

Rising domestic energy bills, which have nearly tripled over the past ten years, have become a political issue. Opposition leader, Ed Miliband thrust it into the spotlight last year when he promised that a future Labour government would freeze energy prices for 20 months following a flurry of price increases by most of the big suppliers last year.

Ofgem's announcement came as SSE, one of the big six, said it would freeze domestic gas and electricity prices at their current levels until 2016. It said, however, it would cut 500 jobs and shelve four planned offshore wind farm developments to cover the resulting profit shortfall.

Ofgem's decision has been welcomed by energy suppliers, who are keen to regain consumer trust. Paul Massara, Chief Executive of RWE Npower, one of the big six suppliers, told a utilities conference in London: "I for one would welcome it as the best way to get to the facts once and for all."

SSE has already said it would legally separate its retail and wholesale businesses by March 2015, in order to "improve transparency".

Some industry experts say the probe, which could last 18 months, is necessary in order to build confidence in a market that is in need of investment.

Katja Hall, CBI chief policy director, said: "An inquiry provides an opportunity to resolve the current debate and win back some much needed confidence in the market. We must have an energy market in this country that can attract the £110 billion of investment needed over the coming years to secure and transform our power supply, while ensuring bills are manageable for both households and businesses."

This was echoed by Frances Warburton, Ernst & Young's Economic Advisory Director. "As we are entering a prolonged period of uncertainty over the nature of the CMA's intervention and its possible outcomes, the danger of a self-imposed cap on much needed investment is real. The CMA and government now need to be mindful of the impact of an investment hiatus, and consider how to avoid a capacity crunch just as margins become historically thin," he said.

He also said that while the investigation should be welcomed, it is likely to be "painful" in the short term.

"The broad range of remedies on the table makes it difficult to firmly assess the direct impact and outcome of an investigation at this stage. It is conceivable that the investigation will not find fault with the utilities themselves, but recommend that the market structure requires change to overcome barriers to entry and to enable competition."

As part of the investigation, regulation of the sector will come under scrutiny and could be subject to change. This will herald the most important phase for the industry since privatisation 25 years ago. In a move widely seen as a direct challenge to Ofgem's role, it will be the CMA that will decide the future path of the market and the level of regulation it will require.

Dale Vince, founder of Ecotricity, one of the few small suppliers, said: "At privatisation there were 12 companies with 100 per cent market share between them, today there are six companies who've got 98 per cent of the market.

"The root of these problems is the way the energy market was privatised, that's where the big six got their uncompetitive advantage. If the regulator had been doing its job, it wouldn't have taken 20 years to get to grips with an obvious problem."

Siemens "vote of confidence" in UK offshore wind

- Siemens encouraged by pipeline of proposed projects
- Plant will create up to 1000 jobs

Siemens' decision to invest £310 million ($490 million) in a wind turbine assembly plant in Hull, UK, is being hailed as a vote of confidence in the country's offshore wind industry.

The German company had expressed an interest in building the plant three years ago but until now had refused to make a firm commitment. In 2012, Siemens signed a letter calling for more clarity about the government's policies on renewable energy, warning conflicting messages could hit investment.

Commenting on the recent decision, Michael Suess, head of Siemens' energy division, said the company had been encouraged by the UK's pipeline of proposed offshore wind projects.

The new facility, which Siemens will build with its partner Associated British Ports, will create up to 1000 jobs as well as work in construction and the supply chain. It will be spread over two sites with an assembly line at Green Port Hull and a new rotor blade manufacturing base in nearby Paull. ABP is spending £150 million, while Siemens will invest £160 million.

Britain's Prime Minister David Cameron said the decision to go ahead is a "massive vote of confidence" in the government's economic plan.

Greenpeace also welcomed the news. UK Executive Director John Sauven said: "This is a welcome milestone in the development of the UK's offshore wind industry. If we're serious about limiting our exposure to costly energy imports the government needs to stop dithering on clean energy and ensure there are a lot more announcements like this one."

According to RenewableUK some 3653 MW of wind turbines are installed in UK waters and a further 14 763MW is in the pipeline.

A recent report by the Offshore Renewable Energy Catapult, shows that the UK economy could gain £6.7 billion per year and create 150 000 jobs by 2020 in offshore wind, wave and tidal energy.

Report makes recommendation on nuclear safety

US nuclear reactors are safer than they were before the Fukushima Daiichi meltdown that occurred three years ago in Japan but automated data collection systems are still not prepared to operate in extreme conditions, according to a US Government Accountability Office (GAO) report.

The GAO report, which studied 16 countries and was requested by the US State Department, recommended that the Nuclear Regulatory Commission (NRC) quickly decide how and whether to upgrade data systems to withstand severe situations. Those systems are responsible for communicating critical power plant data to regulators.

The NRC said it does not consider such emergency response data systems a safety feature. It did not say whether it agreed or disagreed with GAO's recommendation to upgrade those units, noting it is working on areas it considers to be higher priority before making a decision on such systems.

- On the third anniversary of the Fukushima disaster, two class-action lawsuits have been filed in New York City against General Electric Co., according to *Courthouse News Service*.

In one case, lead plaintiff Mitsuru Okura alleges GE and GE-Hitachi failed to properly design, build and maintain the nuclear power plant destroyed by the earthquake and subsequent tsunami.

A summons and notice filed in New York County Supreme Court by Mitsuru Okura seeks compensatory damages of at least $3 million per plaintiff. The filing did not state the number of people included in the class but the news service noted more than 100 000 people were evacuated following the nuclear disaster.

The second case filed by Sasaki Body Ltd. and Mihana Ltd. seeks $5 million in damages per class member.

US plan to limit carbon pollution stumbles

The US has hit another roadblock in its effort to reduce emissions from its power generation sector.

Junior Isles

US President Barack Obama's strategy for fighting climate change is looking less certain after the Republican-controlled House voted in favour of a bill to block the Obama administration's plan to limit carbon pollution from new power plants.

The bill targets Obama's proposal for the Environmental Protection Agency (EPA) to set the first national limits on carbon pollution from future power plants. The bill passed by a 229-183 vote. Ten Democrats, mostly from coal-producing states or the South, joined Republicans in support of it.

"The Obama administration clearly wants to use its regulatory agenda to end coal fired power generation in this country, but that is a pipe dream," said Rep. Mike Simpson, R-Idaho, noting that coal provides nearly 40 per cent of the nation's electricity.

Rep. Henry Waxman, D-Calif., denounced the bill as "a science-denial bill" that would strip the EPA of its ability to block carbon pollution.

The White House has threatened to veto, saying the bill would "undermine public health protections of the Clean Air Act and stop US progress in cutting dangerous carbon pollution from power plants".

Although no new coal plants are currently being considered because of competition from cheap natural gas, Republicans argue that could change if natural gas prices keep rising.

The House bill sponsored by Rep. Ed Whitfield, R-Ky, who chairs the House subcommittee on energy and power, requires the EPA to set carbon emissions standards based on technology that has been in use for at least a year. Republicans and some coal-state Democrats say the EPA rule is based on carbon capture and storage (CCS) technology that is not commercial.

A Senate bill sponsored by Sen. Joe Manchin, D-W.Va., is being proposed that would require the EPA to set standards on based on commercially available technology.

In an effort to speed up the commercialisation of CCS, the President's FY 2015 budget last month requested $475.5 million for a Fossil Energy Research and Development (FER&D) portfolio. FE leads Federal research, development, and demonstration efforts on advanced CCS technologies. In FY 2015, FER&D will continue to focus on CCS and activities that increase the efficiency and availability of systems integrated with CCS.

One of the demonstration projects it manages, FutureGen 2.0, received a boost last month when Illinois regulators gave the FutureGen Alliance the go-ahead for a 30-mile (48 km) carbon dioxide pipeline.

California supports renewables integration with EV roadmap

- California to integrate 1.5 million EVs
- Solar hits all-time high

California is continuing to set the pace in the US in terms of renewables growth and emissions reduction as it revealed plans for electric vehicle (EV) integration into the power grid.

The California Independent System Operator Corporation (ISO) released an updated roadmap of the integration plan that is also aimed at supporting a 2012 executive order to get 1.5 million zero-emission vehicles on California roads by 2025.

Bob Foster, Chairman of the ISO Board of Governors said the plan would ultimately create opportunities to leverage the stored energy in EVs to help manage the power grid.

"Unleashing the power of aggregating electric vehicles includes creating the means for consumers to realise value that shows up in their wallets as well as providing an energy product that aggregators can bring to wholesale power markets and sell," said Foster.

The roadmap points out some near-term wins, such as using smart charging strategies that align with grid conditions so electric vehicle owners, individuals and fleet owners can keep their batteries full while not increasing peak load. This will help avoid the need to build additional generation and transmission costing millions of dollars.

Using EVs as storage to help optimise the grid will become increasingly important as California increases its use of renewables. Under its Renewable Portfolio Standard (RPS), the state requires that the amount of electricity supplied by renewables reaches 33 per cent of total generation by 2020.

California broke all solar power generation records on March 8th, when 4093 MW of solar power was delivered to the grid, smashing the day-earlier record of 3926 MW.

The data, which was revealed by California's ISO, represents an almost 50 per cent increase in nearly two years, when June 2012 recorded 2071 MW of peak solar power production.

Figures from the Solar Energy Industries Association (SEIA) show that California boasts the highest cumulative capacity of installed solar PV of any US state, with 5.23 GW.

Bolivia to invest $135.6 million in former Iberdrola unit

The Bolivian government says it will invest $135.6 million over five years in an electricity distribution company it expropriated from Spanish utility Iberdrola in late 2012.

Vice President Alvaro Garcia Linera made the announcement during a ceremony marking the first anniversary of Distribuidora de Electricidad La Paz, or Delapaz, as Iberdrola's former Electropaz unit is now known.

Linera said the power distributor invested just $8 million annually when "foreigners" ran it. He said this total had increased to $13.2 million last year while under state control.

Delapaz will invest $25.7 million this year and $109.9 million between 2015 and 2018, the vice president said.

No agreement has yet been reached with Iberdrola on compensation for Delapaz and other units expropriated from the Spanish utility: an electricity distribution company serving the western Bolivian region of Oruro, known as Elfeo; an investment management firm; and a service provider.

Bolivia's President Evo Morales said at the time of the expropriation that Iberdrola's failure to provide uniform electricity service in rural areas had caused rates in those zones to climb significantly.

At the start of February, UK-based power generator Rurelec Ltd was awarded over $35.5 million in compensation after an international arbitration tribunal ruled that the Bolivian government was unlawful in its expropriation of shares owned by the British firm in Bolivian energy company, Empresa Guaracachi SA.

Morales says Iberdrola's failure to provide a uniform service caused rates to climb

Mexico leads Latin American agreement on climate change

A plan to promote a programme of regional cooperation on tackling climate change in areas of common interest has been agreed by ministers in Latin America.

Participants in the 19th Latin American and Caribbean Environment Ministers Forum, held in Los Cabos, Mexico, published a final declaration at the end of the three-day meeting in March, noting that the plan will be designed jointly by Mexico, which presided over the forum, and Peru, as the seat of the Conference to the Parties of the UN Framework Convention on Climate Change (COP20) to be held in Lima in December.

The plan will have the support of countries that took part in the forum, and of the UN Environment Programme (UNEP), with the clear objective of "adopting actions against the consequences of the increasing frequency of extreme climatic events".

Countries in Latin America and the Caribbean are responsible for 12.5 per cent of total greenhouse gas emissions worldwide, and could be one of the regions hit hardest by the effects of climate change.

Mexico is already taking steps to reform its energy sector and increase the use of renewable energy sources. In a recent visit to Houston, USA, a Mexican official charged with restructuring the electricity sector said that a priority would be ensuring growth in renewable energy to meet the steep climate targets while avoiding government subsidies for renewables.

"In Mexico, the current companies that are in the wind energy business, they are making money," said María de Lourdes Melgar Palacios, Undersecretary of hydrocarbons for Mexico's Ministry of Energy. Mexico has about 1500 MW of wind power installed but as much as 12 000 MW could be developed in the next decade, according to the Ministry of Energy.

"When we go to the new system, that is what we are working on with market experts – how do you make sure that the incentives do not disappear?" she added.

Mexico passed legislation last year that effectively ends the monopoly status of state oil company Petroleos Mexicanos , or Pemex. The new laws will also transform the state power company, the Federal Electricity Commission – establishing an independent grid operator and creating an energy trading market.

The government plans to establish a system of clean energy and emissions credits that companies will be able to buy and sell to comply with the new requirements.

Melgar said policymakers still are working out the details of the certificate system.

Australia keeps faith in carbon tax

The government's failed attempt to repeal Australia's carbon tax means that the country will continue to have an effective climate policy. **Syed Ali**

Australia looks set to continue to have an effective climate policy framework after the Senate of the Australian Parliament voted to reject the Coalition government's legislation to repeal the Carbon Tax.

The package of repeal bills was finally put to a vote in the upper house in March after months of debate but was defeated 33 votes to 29 after the Australian Labor Party (ALP) and the Australian Greens combined their numbers to reject the Coalition's legislation.

The government had been trying to pass the carbon tax repeal bills as a matter of priority since December 2013. The package passed the lower house in November but the Coalition finally has faced an impasse in the Senate.

According to the ALP, the Senate's vote ensures that the country will maintain a working climate policy.

"Without a credible alternative, Labor cannot support the abolition of the existing clean energy policies," Shadow Climate Change Minister Mark Butler said.

Butler added that Labor's amendments would have removed the carbon tax but retained a legislated cap on carbon pollution and brought an emissions trading scheme (ETS) forward to July 1, 2014, noting that market-based approaches were the most cost-effective way to tackle climate change.

"In contrast to Labor's ETS, Tony Abbott's Direct Action policy will cost the taxpayer billions of dollars and won't do enough to tackle climate change," Butler said.

The Australian Greens also confirmed that they voted to maintain the price on pollution. Greens Leader Christine Milne also said that momentum for emissions trading is building around the world ahead of the 2015 global climate negotiations.

She added: "If Australia is left behind it will be our jobs, industry and innovation that will suffer."

Some argue that current emissions legislation has created difficult operating conditions for Australia's energy utilities and a resulting squeeze on operating margins. A decision to repeal the carbon tax would have given owners of coal-fired power stations a significant competitive advantage over gas and other energy sources.

At the end of February Stanwell Power Corp, an electricity producer owned by Queensland state, decided to restart two coal units stating that it would improve the company's competitiveness.

■ Australia's competition regulator last month rejected AGL Energy Ltd.'s proposed A$1.51 billion ($1.35 billion) purchase of power assets from the government of New South Wales state. The Australian Competition and Consumer Commission's rejection of the deal marks a setback in the state government's plan to raise money to fund new infrastructure projects.

Russia eyes Pakistan power sector

- Russia ready to implement power projects near Muzaffargarh
- Deals struck for Gadani Power Park

Syed Ali

Russia is offering to invest in Pakistan's power sector. Addressing the business community at Multan Chamber of Commerce and Industry (MCCI) in March, Yury M Kozlov, trade representative of Russian Federation in Pakistan said Russia saw Pakistan as a significant market, with many Russian investors interested in exploring joint ventures and investment.

Kozlov said negotiations are in progress with Pakistan for energy projects and cooperation in science and technology. He added that Russia is ready to implement 500-600 MW coal fired power projects near Muzaffargarh and Jamshoro and to modernise and convert other power plants to coal.

Russia is one of many foreign and domestic investors interested in establishing power projects in Pakistan.

Early last month the Private Power and Infrastructure Board (PPIB) approved a host of projects with a total capacity of 2630 MW.

This cleared the way for issuance of a letter of interest to the consortium of CWE Investment Corporation China and Trans Tech of Pakistan for the 590 MW Mahl hydropower project.

The board also approved issuance of a letter of intent to the joint venture of Al Mirqab Capital of Qatar and Sinohydro Resources of China for developing two 660 MW coal fired power plants at Port Qasim, Karachi.

Notably, a memorandum of understanding (MoU) was signed in Islamabad between Private Power and Infrastructure Board (PPIB), Ministry of Water & Power and Arab National Construction (ANC) Holding LLC, Dubai, for the construction of two 660 MW coal fired plants at Pakistan Power Park in Gadani, near Karachi.

Official sources said the project would bring in about $2.5 billion in investment to Pakistan and would be completed in three years.

They said 10 coal fired power plants, each with a capacity of 660 MW, will be constructed at Gadani, where Chinese companies have agreed to invest in six projects. ANC Dubai recently signed a deal to construct two projects and the government of Pakistan has initiated another. Nine of the 10 projects are in progress with a combined capacity of 5940 MW.

Pakistan has seen significant international investment for major projects in recent months. In March, World Bank (WB) Country Director, Rachid Benmessaoud, said it expects to approve assistance for the 4600 MW Dasu hydropower project. He said that the WB is encouraged by the positive economic indicators and expects to approve the assistance for the power project.

Germany's Deutsche Bank has said it will provide $1 billion, while Industrial and Commercial Bank of China (ICBC) will lend $2 billion to the project.

Pakistan's Water and Power Development Authority (Wapda) Chairman Syed Raghib Abbas recently told the Senate Standing Committee on Water and Power that the Dasu Dam, to be constructed on the Indus River, would cost $4.2 billion and work on the mega project would start by the end of this year.

Nuclear law hampering Indian investment

US Energy Secretary Ernest Moniz says India needs to resolve a contentious civil nuclear liability law, which is hampering investment in the country's nuclear energy sector.

Following talks with Indian officials on energy issues in New Delhi, Moniz said that India needs to align its nuclear liability law with an international convention on compensation that is due to come into force this year.

Foreign companies are concerned that the law disproportionately burdens suppliers of nuclear equipment with payments in case of an accident. US companies are unhappy that more than five years after the US facilitated a deal lifting an international nuclear trade ban on India, they have not reaped the benefits they had hoped for.

The US-India energy dialogue is important as the US seeks to expand its market for renewable energy technologies. India, which suffers from massive power shortages, has huge potential.

Moniz told Indian industry that investment in clean energy is estimated at $36 trillion worldwide in the next four decades and is a huge opportunity for the private sector.

According to GlobalData the Asia-Pacific (APAC) solar photovoltaic module market value is expected to climb from $6.7 billion in 2012 to $8.6 billion by 2015.

On February 28, Solar Energy Corporation of India signed a Memorandum of Understanding (MOU) with AP Industrial Infrastructure Corporation (APIIC) and New and Renewable Energy Development Corporation of Andhra Pradesh for setting up a 1000 MW solar park.

■ After three years of negotiations, India and France have agreed on the cost of power that will be generated by the Jaitapur nuclear power plant, clearing a major hurdle in the project.

Japan promotes renewables alongside nuclear

Japan's government has drafted a Basic Energy Plan that describes nuclear power as an important electricity source but also emphasises the importance of promoting renewable energy.

A draft outline of the policy obtained by *Kyodo News* said that nuclear energy is an "important baseload power" and that the government will push for the restart of reactors that have satisfied new safety requirements introduced after the March 2011 Fukushima Daiichi nuclear disaster.

As for renewable energy sources, the draft indicated that the government will stay focused on accelerating the introduction of such sources in the longer term, stipulating that government efforts will continue beyond the period of "about three years starting from 2013".

Last month a government panel recommended Japan lifts the amount utilities must pay for electricity from offshore wind farms while cutting prices for power fed in from solar projects, as the country looks to diversify its use of renewable energy.

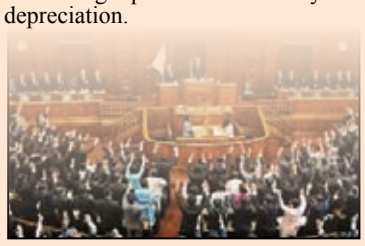
Japan, hoping to boost alternative energy in the wake of Fukushima, introduced a feed-in tariff scheme in 2012, under which utilities must buy all power generated from renewable sources such as wind, solar or geothermal.

The huge earthquake and tsunami that triggered the Fukushima nuclear crisis also exposed the vulnerability of Japan's power system, prompting moves for market reform.

At the end of February the government approved bills that will set the stage for Japan to move ahead with liberalisation of the retail electricity market, which has been dominated by regional monopolies for the past 60 years.

The liberalisation of the market for households and other small consumers around 2016 is the second part of a three-stage electricity sector reform.

■ With nuclear plants still offline, 10 electric power and four gas utilities in Japan are set to raise their rates in April for the third straight month due to oil and gas price hikes and the yen's depreciation.



Indonesia has big transmission plans

State-owned electricity company, PT Perusahaan Listrik Negara (PLN) plans to spend Rp60 trillion ($5.24 billion) building power transmission facilities in Sumatra to improve the electricity network on the country's largest island.

State-Owned Enterprises Minister Dahlan Iskan said that PLN would cooperate with five other state-owned firms on the project and that funding would come from state-owned banks.

Dahlan commented: "Currently a number of power plants are under construction in Palembang [South Sumatra], which will be completed by 2016. When the plants are completed, the transmission network will help the north of the island. The transmission network will be a long-term plan."

Industry calls for shale gas exploitation to tackle high energy cost

The high cost of energy has led big energy users, especially in Germany, to lead the call for shale gas exploration.

Europe's large industrial energy users are calling for governments to exploit shale gas resources to cut energy costs.

A report published by international consultancy IHS said Germany's exports would have been €15 billion higher last year if its industry had not paid a premium for electricity compared with international competitors.

The report found that the energy price differential between Germany and its five leading trade partners cost the nation's manufacturing sector €52 billion in net export losses for the six-year period from 2008 to 2013.

According to IHS, reforming its *Energiewende* policy, to slow the pace of renewables development while expanding the role of gas, would enable Germany to reduce costs.

Kurt Bock, BASF chief executive, said last month: "In Europe, we have the most expensive energy and we are not prepared to exploit the energy resources we have, such as shale gas."

It estimated that 20 billion m^3 of shale gas production per year is possible in Germany by 2030 – the equivalent of a quarter of current gas consumption.

Daniel Yergin, of IHS, said: "We've come to the conclusion – and you won't know for sure until you drill – that Germany has the potential to have significant shale gas resources, which would help reduce costs; help make Germany more competitive."

Other European industrial consumers have voiced similar concerns. Under the umbrella of IFIEC Europe, the international federation of industrial energy consumers, more than 100 CEOs from the manufacturing sector recently issued a manifesto calling on the European Union's 28 Heads of State to address rising energy prices.

Marcus Pepperell, spokesperson for Shale Gas Europe said: "This manifesto is a clear indication of the impact high energy costs are having on European business. Europe needs a secure and affordable energy supply that meets public demand and powers its industries. Yet 3.5 million manufacturing jobs have been lost across Europe since 2008 and energy costs are two to three times higher in the EU than in the US.

Some countries such as Poland and the UK are pressing ahead with shale gas exploration.

The Polish government last month announced a series of amendments to its Geological and Mining Law which will provide a streamlined licensing process for the domestic shale gas industry, and introduced a more favourable tax environment to encourage investment and enable it to compete with other sources in the country's energy mix.

Meanwhile, Sam Laidlaw Chief Executive of UK energy company Centrica told an international energy conference in the US that shale gas has great potential in the UK.

Addressing the CERAWeek Global Gas Plenary in Houston, Texas, Laidlaw said the UK's dependency on gas means that over time, shale gas has the potential to make a significant contribution to the UK's future energy mix. But as yet, that potential remains unproven and many challenges must be addressed.

One of the main challenges facing the UK and other countries, however, is public acceptance. An Ipsos MORI survey for the UK Department of Business, Innovation, and Skills, published in March showed that among those who have heard of each of the respective technologies (offshore wind farms, fracking, and carbon capture storage), people are largely supportive of offshore wind farms (76 per cent support their development), but less so when it comes to CCS (51 per cent) or fracking (36 per cent).

Greenpeace UK energy campaigner Lawrence Carter commented on the survey: "Later this year over 60 per cent of the country will be opened up to fracking exploration… despite the Prime Minister's claims about how tightly the fracking industry would be regulated, it now turns out that half of the people surveyed don't trust the government to ensure it's safe."

Renewable energy consumption up in EU

Renewables consumption grew by 6 per cent between 2004 and 2012. According to figures recently released by the EU statistical office Eurostat, in 2012 energy from renewable sources represented an estimated 14.1 per cent of gross final energy consumption in the European Union (EU).

The share of renewables in the EU's gross final energy consumption was 8.3 per cent in 2004 when this data was first available.

Since then, the share of renewable sources in gross final consumption of energy grew in all member states. The largest increases during this period were recorded in Sweden (from 38.7 per cent in 2004 to 51.0 per cent in 2012), Denmark (from 14.5 per cent to 26.0 per cent), Austria (from 22.7 per cent to 32.1 per cent).

The highest shares of renewable energy in final energy consumption in 2012 were found in Sweden (51.0 per cent), Latvia (35.8 per cent), Finland (34.3 per cent) and Austria (32.1 per cent), and the lowest in Malta (1.4 per cent), Luxembourg (3.1 per cent), the UK (4.2 per cent) and the Netherlands (4.5 per cent).

In 2011, Estonia was the first EU member state to reach its 2020 target (25 per cent), while Bulgaria and Sweden achieved their 2020 targets in 2012 (16 per cent and 49 per cent, respectively).

The national targets take into account the member states' different starting points, renewable energy potential and economic performance. The target to be reached by 2020 for the EU as a whole is 20 per cent.

■ An Extraordinary General Assembly of the European Renewable Energy Council (EREC) in Brussels on March 6 decided on the "voluntary" dissolution of the non-profit organisation after more than a decade of existence.

EREC President, Rainer Hinrichs-Rahlwes, said: "EREC was forced to decide to go into liquidation mainly due to its high liabilities arising from its lease obligations for the three large office buildings which make up the Renewable Energy House, 63-67 rue d'Arlon in Brussels, Belgium.

The Renewable Energy House (REH) was inaugurated in 2006 as a showcase for sustainable energy with EREC as the main tenant of all three buildings until 2032. This was the result of a challenging project proposal by HRH Prince Laurent of Belgium the previous year: to turn a then 140-year old neoclassical building into a living renewable energy and energy efficiency showcase in the heart of Brussels.

Relief provided by UK carbon floor price freeze may be temporary

- Price held at £18/t through 2016/17
- Experts argue decision creates uncertainty

Junior Isles

Industry experts have warned that any relief felt by energy users as a result of the UK's decision to freeze the Carbon Price Floor (CPF) may be temporary.

In its latest budget announcement, Britain's government said it would freeze the CPF in order to reduce upward pressure on electricity costs to all end users and in turn avoid a growing competitive disadvantage for the UK's energy-intensive industries.

Tony Ward, Head of Power & Utilities at Ernst & Young said: "With the rest of Europe's leading economies stalling over their previous commitment to driving low carbon investment and a more pronounced self interest now guiding many of their decisions, it is time too for the UK to reassess the speed and route it wishes to take to re-engineering its generation mix."

He warned, however, that any potential relief felt by energy users might be temporary.

"This change of heart on a measure to quickly increase the cost of carbon in order to incentivise low carbon investment so soon after its introduction is the latest in what looks to be an emerging pattern of policy adjustments in mid-flight. With the changes to solar feed-in tariffs, to the ECO scheme and now this change to the CPF so early in its life, investors who have committed to build assets or businesses off the back of the original policy instrument will be increasingly suspicious of any new UK government policy."

With the CPF held constant for 2016/2017 at £18.08/t, the same level as 2015/2016, power prices will be about £2/MWh lower than if the government retained the original CPF trajectory, according to estimates.

Phil Grant, Partner in Baringa Partners' Energy Advisory Practice commented: "The freeze is potentially good news for coal fired generators, who will remain competitive with gas fired generation longer into this decade. In the original trajectory of the Carbon Price Floor, coal would have become more expensive than gas fired generation by around 2016/2017."

Grant, however, also voiced concerns on the uncertainty created by the move.

"This creates more uncertainty for owners and developers of gas fired generation, as they are now less certain about future operating levels. It also creates more uncertainty for renewable developers, opting to develop plant under the Renewables Obligation," he said.

"Paradoxically, the original intent of the Carbon Price Floor was to help provide certainty for investors by underpinning the uncertainty on future carbon costs reflected in the wholesale power price. Therefore it is critical that any change in the trajectory of the Carbon Price Floor through to 2020, as well as making the change in the tax level for 2016/2017, provides clarity and certainty in the longer term trajectory."

■ Renewable energy developer RES is ceasing work on its biomass power station project at the Port of Blyth in Northumberland. RES' decision follows the withdrawal of a key project partner in late 2013 due to ongoing uncertainty in UK energy policy.

RES' Chief Operating Officer for the UK Gordon MacDougall said: "It's bitterly disappointing for RES that we are unable to bring this exciting project forward… However, the gradual erosion of support for dedicated biomass leaves us with no other option."

Solar gathers pace

As the rate of solar installations gathers pace, the International Energy Agency says integrating high rates of intermittent renewables is possible.

Junior Isles

According to preliminary figures gathered by the European Photovoltaic Industry Association (EPIA) and presented during its 9th Market Workshop in Brussels, the world added at least 37 GW of new PV capacity in 2013. The global PV cumulative installed capacity reached an impressive 136.7 GW at the end of last year, which represents a 35 per cent increase compared to the year before.

Dynamic Asian markets, led by China and Japan (around 11.3 GW and 6.9 GW, respectively), saw the region take over from Europe as the leading PV installer. Asia-Pacific represented 57 per cent of last year's global market. The trend is expected to continue as China experiences robust and sustained volumes, which should enable the country to remain the number-one market in the coming years.

The global concentrated solar power market is also expected to see major growth in the next five years. A new report from research and consulting firm GlobalData forecasts cumulative installed capacity to increase from 357.9 MW in 2014 to 1043.96 MW by 2020.

A recent report published by the International Energy Agency (IEA) said the deployment of both solar and wind technologies has expanded rapidly in recent years and predicts the trend will continue for decades.

The report, entitled 'The Power of Transformation – Wind, Sun and the Economics of Flexible Power Systems', addresses concerns of whether power systems remain reliable and cost-effective while supporting high shares of variable renewable energy (VRE), and if so, how?

It concluded that integrating high shares – 30 per cent of annual electricity production or more – of wind and solar PV in power systems can come at little additional cost in the long term.

Launching the report, IEA Executive Director Maria van der Hoeven said: "This new IEA analysis calls for a change of perspective. In the classical approach, variable renewables are added to an existing system without considering all available options for adapting it as a whole.

"This approach misses the point. Integration is not simply about adding wind and solar on top of 'business as usual'. We need to transform the system as a whole to do this cost-effectively."

As a member of the advisory stakeholders' board, EPIA – the European Photovoltaic Industry Association – welcomed the report's conclusions.

"This report rightly shows that the cost of renewables-based power systems can be minimised by adapting some planning and operational procedures", said Giorgia Concas, EPIA Policy Advisor.

"This way, photovoltaics and wind would bring higher benefits to the system," she continued.

■ Morocco has opened a final tender for construction of five wind farms totalling 850 MW, worth an estimated $1.7 billion, for which five consortia have been pre-qualified, state-run power utility ONEE said.

Funding floods into Africa

Africa's power sector is continuing to attract significant foreign funding.

Earl Gast, the United States Agency for International Development (USAID) assistant administrator for Africa, said last month that the Power Africa Initiative is gaining ground in terms of financial availabilities. The Power Africa Initiative, along with Trade Africa, was launched last year following US President Barack Obama's visit to Africa.

Gast said that currently, Power Africa has secured close to 20 per cent of the $7 billion, which is to be available for 20 million Africans. Ethiopia, Kenya, Tanzania, Ghana, Liberia and Nigeria are the six benefiting countries of the initiative that will help to generate some 10 000 MW.

Meanwhile, the African Renewable Energy Fund (AREF) says it has raised $100 million in capital to support small- to medium-scale independent power producers (IPPs) in sub-Saharan Africa. Lead investor in the fund, the African Development Bank (AfDB), said it expects this amount to double this year.

According to a statement released in Lusaka, the funds would target IPPs with an ideal size of 5-50 MW and a commitment per project of between $10 million and $30 million.

These funds would be invested in grid-connected, development stage renewable energy projects including small hydro, wind, geothermal, solar, biomass and waste gas.

China is also lending to the region. In early March, Chinese Ambassador Zhou Yuxiao and Zambian Finance Minister Alexander Chikwanda signed a Framework Agreement on the provision of a Concessional Loan by China to Zambia.

According to the agreement, the Export and Import Bank of China will provide the Ministry of Finance of Zambia with a concessional loan of $41 million. The loan will be utilised for construction of the 120 km power transmission line between Kariba North and Kafue West.

Power cuts highlight desperate need for power

Recent power cuts in South Africa have once again highlighted the country's urgent need to add new generating capacity. According to industry observers, the country should already be planning another large scale power station.

In late February, state utility Eskom declared an emergency as the power system was severely constrained due to the loss of generating units, reduced imports and the extensive use of emergency reserves.

Frans Cronje, deputy CEO of South African Institute of Race Relations said their research showed that with Eskom as the sole power generator, it would need to bring into operation "new generating capacity on a scale equivalent to Medupi every five years... for the next 20 years". Medupi is a 4800 MW coal fired power station.

South Africa has been on a tight power supply since load shedding in 2008 cost the economy billions of rand as demand outstripped supply. Eskom had budgeted Rand385 billion ($35 billion) for building new generation capacity between 2005 and last year, and wants to secure much more funding – possibly surpassing Rand1trillion by 2026.

While much of this budget is earmarked for large baseload plant, the country is conscious of its need to cut emissions from a sector dominated by coal fired power plants.

South African Finance Minister, Pravin Gordhan, acknowledged the need to address climate change and reduce emissions during his budget speech last month.

He said this would be done through the proposed carbon tax, environmental regulations, renewable energy projects and other support programmes.

The South African government concluded 47 renewable energy projects, worth Rand70 billion, in 2012 and 2013, many of which are already under construction. Combined, these new developments will add 2460 MW of capacity to the country's national grid, easing constraints as well as pressure on their economy.

China streamlines for international nuclear market

■ Conglomerates create unified technology
■ South Africa considering Chinese proposal

Sun: companies should join forces

China is streamlining its nuclear supply sector in an effort to secure more international projects.

Two business conglomerates led by Chinese nuclear power enterprises have created a new unified technology as part of a strategy to avoid confusion and reduce competition by using the technology to boost exports.

Sun Qin, chairman of China National Nuclear Corp (CNNC), said in a statement that China's nuclear power industry was facing world-class competition around the world and therefore domestic companies in the sector should join forces to venture into the global market.

Sun further stated that CNNC and China General Nuclear Power Group (CGN) had developed common third-generation nuclear technology known as the Hualong I (first dragon) to facilitate overseas expansion.

The statement followed reports in Shanghai's *China Business News* that two business conglomerates led by Chinese nuclear power enterprises have seen their bids for a UK-based nuclear project withdrawn by China's State-owned Assets Supervision and Administration Commission.

The creation of the Hualong I brand is expected to reduce competition when the two giants are bidding for international nuclear projects. "We have reached a consensus that whoever wins an overseas deal will use the Hualong brand," Sun said.

Over the past two years, the two companies have been competing with each other to expand internationally. They had respectively partnered with French and US nuclear power companies to bid for the UK's Horizon nuclear project.

The UK is one of several markets being targeted by China.

Last month Saudi Arabia and China reaffirmed their commitment to intensify energy cooperation. In a joint communique issued by both countries, the two sides pledged to strengthen cooperation in several areas including the peaceful use of nuclear power.

Meanwhile, South Africa's government is currently considering a recently drawn-up draft agreement under which China would build new nuclear power plants in the country.

China is currently having to compete with the likes of Canada, France, the US and Russia in the international arena. However, with the high capital cost of nuclear plants, China and Russia have an advantage of being able to provide financial assistance in building projects.

South Africa's energy ministry said the agreement "will lay the foundation for further co-operation in skills development, and will be funded up to 95 per cent by Chinese institutions".

Russia is also keen to invest in nuclear in South Africa and has offered a package of design and construction proposals that include financial assistance.

Like China, Russia has been looking to take greater market share from its western competitors. In late February Russian energy company Rosatom reached an agreement with Finland's Ministry of Employment and the Economy to cooperate in the peaceful use of nuclear energy.

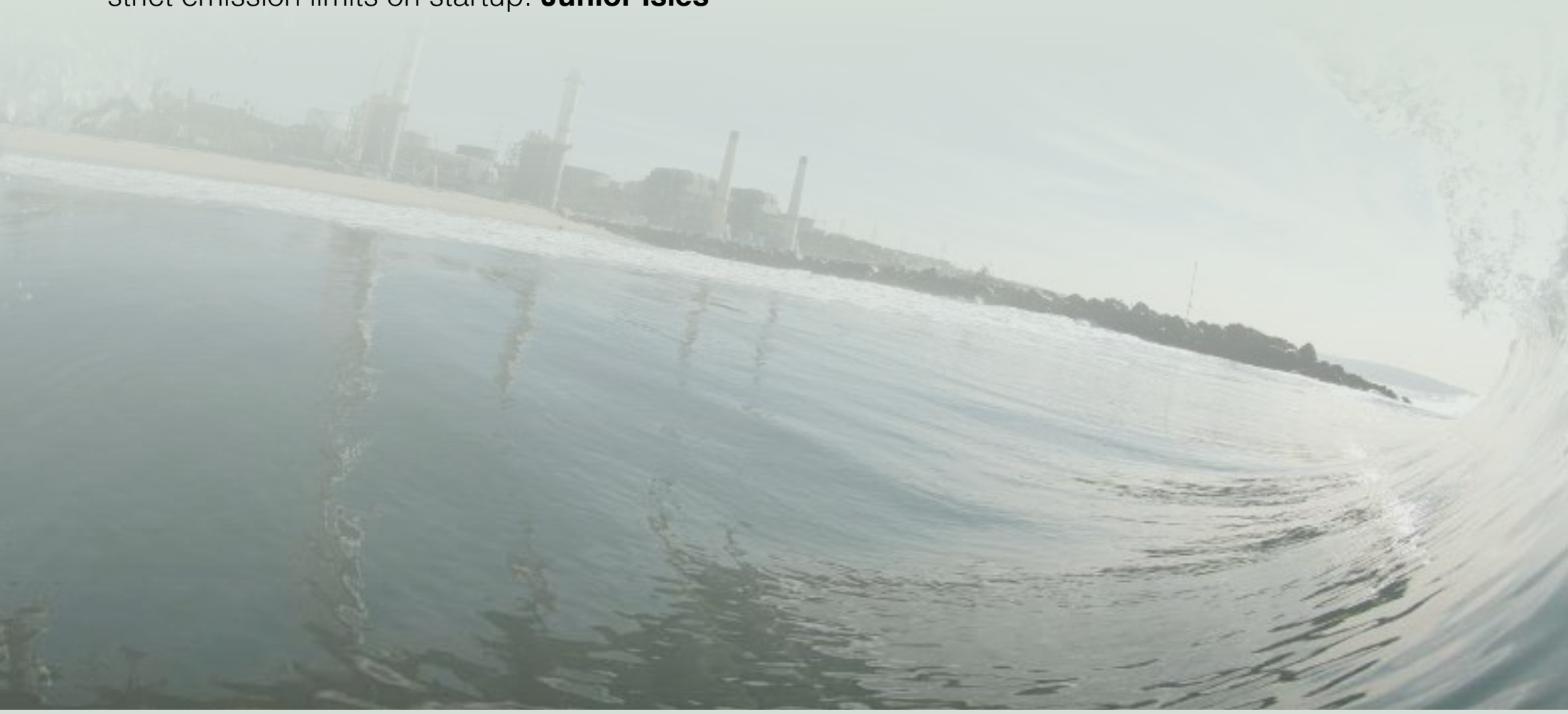
A report in March by *IRNA*, Iran's official news agency, said visiting Russian official Nikolai Spassky and Iranian nuclear officials reached an initial agreement on building two new 1000 MW nuclear power plants for Iran.

Iranian officials say the country needs to achieve 20 GW of nuclear capacity by 2020.

Special Project Supplement

Fast start boilers set the pace at El Segundo

New fast start boiler technology at the El Segundo combined cycle power plant is helping the state of California to integrate an increasing amount of intermittent renewables into the grid while meeting strict emission limits on startup. **Junior Isles**



As perhaps the most forward-thinking state in the US in terms of emissions reduction, California is often the hotbed for pioneering, cutting-edge technology.

September last year saw the inauguration of a new combined cycle gas turbine (CCGT) plant at El Segundo, which features ground breaking boiler technology that will help the plant meet California's strict NO_x emission limits and deliver the levels of operational flexibility required by the plant's owner.

The 550 MW CCGT facility, owned by NRG Energy, is only the second in the US to feature Siemens Flex Plant technology but perhaps more notably, is the first to incorporate NEM's new DrumPlus™ heat recovery steam generator (HRSG).

Unlike conventional drum-type HRSGs, the new boiler is able to start fast, ramp-up and down quickly, and handle a greater number of starts per year. This greater operational flexibility will be possible while maintaining the same design life span of a conventional drum-type HRSG and the expected performance in terms of steam production.

The DrumPlus HRSG is designed to match the changing operating regime of today's gas turbines. The new El Segundo CCGT units highlight what is a growing trend among US plant operators to install gas fired plants that have the operating flexibility to operate alongside the growing amount of renewable generation on the grid.

California is among the strictest states in the US with regards to power plant emissions. In 2006 the California Global Warming Solutions Act was passed, requiring the Air Resources Board (ARB) to adopt a state-wide greenhouse gas emissions (GHG) limit equivalent to the statewide GHG emissions levels in 1990 to be achieved by 2020.

At the same time it adopted a Renewable Portfolio Standard (RPS), increasing the amount of electricity generated from renewables from 17 per cent to 20 per cent by 2010. This was expanded in 2011, requiring that the amount of electricity supplied by renewables reaches 33 per cent of total generation by 2020.

The burgeoning amount of renewables on the grid requires additional peaking plant to compensate for the variability of renewable generation such as wind and solar. In the US, gas fired simple cycle peaking power plants have become the favoured technology for providing this renewable support.

Equipment manufacturers, however, have also been working to improve the start-up and load following capabilities of CCGT plants so that they that are also able to back up renewables but with a much higher electrical efficiency than peaking plants. The El Segundo plant has an electrical efficiency of about 49 per cent, around 9-10 percentage points higher than a traditional simple cycle gas turbine peaking plant.

The new El Segundo Energy Centre is the latest move in NRG's ongoing drive to lower emissions from its thermal generating fleet while at the same time allowing greater use of renewables. Although NRG has committed to a capacity factor of about 60 per cent, which equates to a little over 5400 h/year, the plant has to be available 24/7.

El Segundo is able to help meet both California's baseload and peak load demand through its fast start technology. The plant's two units are able to deliver 300 MW from the gas turbines in less than 10 minutes and the remainder in 1 hour; for a combined cycle, this has been described as game-changing technology.

The new Flex Plant 10 replaces two old units at the existing facility. The old plant comprised four units – Units 1 and 2, which began operating in the 1950s, and Units 3 and 4, which have been running since the 60s. Units 1 and 2 were retired in 2002 and demolished to make way for the two new units. Unit 3 has also since been retired, while the 335 MW Unit 4 is still operating.

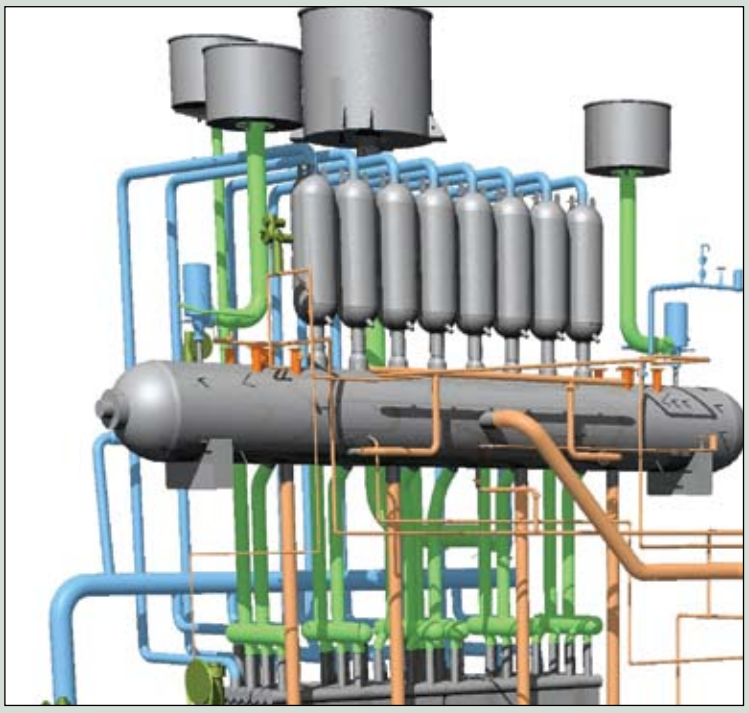
In addition to helping the integration of renewables, the project brings several other benefits: it reduces the consumption of potable water by nearly 90 per cent; it meets or exceeds the State and South Coast's strict air quality standards; and will use 30 per cent less natural gas per megawatt produced than the original steam boilers.

The new plant features two power islands delivered by Siemens. Each unit comprises an SGT6-5000F gas turbine, a SST-800 steam turbine rated at 70 MW, an SGen6-100A-2P generator, a heat recovery steam generator (HRSG) and an air-cooled heat exchanger. Siemens also supplied the complete electrical equipment and the SPPA-T3000 power plant instrumentation and control system.

Although all the Siemens-supplied equipment are existing components that have been proven in the field, the CCGT units feature first-of-a-kind HRSG technology.

Jeroen Overduin is part of NEM's global sales and leads the marketing of its fast start technology. He explained the drivers behind NEM's development.

"We like to present ourselves as an expert in fast start technology, having built many Benson HRSGs and having developed DrumPlus technology. In addition to flexibility, the big driver is emission control. The faster you can start, the less fuel is used. In



CAD drawing of NEM's DrumPlus design. The HRSG consists of a small drum for primary water/steam separation and bottles for secondary water/steam separation

California, you have to start fast in order not to exceed the amount of emissions allowed. In other US states if you are building a plant today, you have to think about [emissions legislation in] the next 25 years.

"The merchant power markets that exist in many states in the US also mean that plants have to be ready to start-up or shutdown at short notice."

US plant owners are comfortable with drum-type boilers. DrumPlus boilers do not have strict water quality requirements and can therefore operate without additional feedwater equipment such as a condensate polishing plant.

Peter Rop, NEM's Manager R&D commented: "We saw that, especially in the US, there is a market for fast-starting HRSGs. So for the American market, where we expected the most peaking demand, we wanted to develop a horizontal drum-type boiler with the pressure parts optimised that allow gas turbines unrestricted, daily start-ups."

Development of the boiler first began around 2005/06. At this time NEM obtained a patent covering the initial R&D work, which focused on the drum itself.

Conventional HRSGs are unable to start quickly and suffer from creep and fatigue damage due to thermal stresses when subjected to fast start and cycling conditions.

For a boiler to operate flexibly, its pressure parts must be able to handle rapid temperature transients. Generally, this means they should be smaller and thinner in order to limit thermal stress. However, the trend towards larger gas turbines with higher efficiency meant that pressure parts were becoming thicker in order to handle the higher steam temperatures and flows.

"This is the exact opposite of what you want to achieve," noted Rop. "You want to go faster but have pressure parts that only allow you to go slower."

NEM therefore set out to design a smaller drum. "The basic trick is to take stuff out of the drum, so that it can be smaller in diameter and therefore thinner, which allows it to go faster," commented Rop.

A water/steam drum has two main functions. The first is to separate water and steam, with water being sent back into the evaporator and steam fed to the superheater. Secondly, before steam is sent to the superheater, it has to be dried to remove droplets of mist from the steam. If this second function is taken out of the drum, the drum can be made smaller with thinner walls. This enables it to accommodate higher thermal transients for the same thermal stress.

Instead of having a large high-pressure steam drum, NEM decided to take the secondary water/steam separators out of the drum and place them inside individual pressure vessels, or bottles, at the top of the boiler.

Although this is a patented design, NEM wanted to stick to conventional parameters and off-the-shelf products as much as possible. The number and height of the bottles are based on the required steam quality and conventional feedwater requirements (up to 170 bar). Rop noted that "it was quite a challenge to find standard water/steam separators that could do the job".

The other area that enabled a reduction in drum size is the 'retention time', also known as 'hold-up' time. This relates to the amount of water reserve in the drum.

Pat Albert , Vice President of Engineering, NEM, USA explained: "If something happens with the upstream feedwater supply, for example if you lose a feedwater pump, you need time to take action to avoid tripping the unit. Today's power plants have an approximately two minute holdup time. During the development of the DrumPlus we determined that, with the control system utilised at El Segundo, 30s was sufficient. We managed to design a boiler with an actual hold-up time of about 50s."

These two developments allowed NEM to make the drum diameter about 35 per cent smaller than a conventional drum (1300 mm vs 2000 mm). Consequently, wall thickness is also reduced: 60-90 mm (depending on HP drum pressure) compared with 140 mm in a conventional steam drum.

Work on other details of the boiler started in 2007 when Siemens in Orlando, USA, approached NEM to develop a boiler for its Flex Plant 10 CCGT plants. NEM worked with Siemens on a boiler design for the El Segundo units, with the key consideration being that it should not restrict the operation of the gas turbine. The design had to ensure that no hold points are imposed on the gas turbine during start-up, allowing for a 30 MW/minute ramp rate of the combined cycle block, while maintaining emissions at the stack to less than air permit levels.

According to Siemens, the plant's fast start ability to deliver 200 MW from each unit in 30 minutes, or less, can result in a 30 per cent reduction in greenhouse gas emissions when compared to traditional F-class combined cycle plants.

Going from a typical start-up time of around 45-60 minutes for a conventional HRSG, to a time of 10 minutes is a big step change. It called for the entire boiler system – from the superheater to economiser – to be evaluated.

Albert noted: "Although the steam drum is critical, there are other features of the HP system that allow the DrumPlus to work as it does. For example header sizes and thicknesses, flexibility of piping all had to be evaluated for that fast start."

> The entire boiler system – from the superheater to economiser – had to be evaluated

Rop added: "We did a lot of dynamic simulations not only for the drum but for all the components assembled to ensure they worked together as a well integrated total solution. So we optimised superheater material selection, separators and start-up/shutdown concepts including all the controls."

In addition to the changes in the drum, modifications were made to the evaporator bundle. Smaller diameter tubes were used so that there is less water in the tubes. This limits the amount of swell or shrink of the evaporator during fast startup or shutdown.

Rop said: "You have to minimise the volume of the bundle and this can be done using smaller tube diameters. Smaller tube diameters, however, means more friction. So it's harder for the evaporator to properly circulate the water in the water/steam mixture."

The bundle layout therefore had to be modified along with the feeder system to ensure that all harps receive enough water flow. The riser system – which transfers the water steam mixture from the bundle to the drum – was also carefully designed to ensure that tubes that produce a large amount of steam do not choke-off those that do not produce much steam.

Rop noted that getting the circulation right was quite a challenge. "We had to split up the evaporator into different parts and give them their own customised riser system so that they can dump their steam/water mixture as freely as possible into the drum, without being choked or getting internal circulation in the evaporator bundle."

It was also important to use the right materials. Superheater headers had to be thin and interconnecting piping had to be flexible to accommodate the large temperature difference that occurs between harps during fast starting.

"If there are short stiff connecting pipes between the harps, there is no flexibility to accommodate the large expansion differences," noted Rop.

The El Segundo boiler is a relatively simple single pressure system suited to the compact site. It is capable of producing 78.3 kg/s of steam at a temperature of 502°C and a pressure of 99.6 bar.

In order to maximise efficiency of this single pressure system, the temperature of the feedwater at the economiser outlet is very close to the saturation temperature. This increases the risk of bubble formation in the economiser, which is undesirable as the economiser would then become a partial evaporator.

It is therefore essential to ensure that the economiser is always supplying liquid water with no steam bubbles. This means that during fast transients, it is necessary to inject additional cold feedwater at strategic locations to supress steam formation. A feedwater bypass over the economiser was therefore introduced.

Rop added: "The control loop also has to be fast enough and you have to measure at the right locations to determine if you are getting close to the limit and how much you need to inject. Feedwater control was also an issue for the drum level because if you make the drum small there's not a lot of water in the drum. This means that controlling drum water level becomes more sensitive. If you supply a lot of feedwater, the drum level will respond much more violently."

Extensive dynamic simulation was therefore required to determine the right control regime during the various phases, i.e. fast start-up, shutdown and load changes.

A special attemperator was also designed. The gas turbine can reach full load in 12 minutes, with the boiler following with a delay of 5-6 minutes. However, although full steam conditions (in terms of flow and pressure) are reached in the boiler, the steam turbine cannot be started as quickly. The steam has to therefore be sprayed down to a temperature level that is acceptable for the steam turbine.

Rop explained: "With this high steam flow and temperature, you need to inject a lot of attemperator

The bottles for secondary water/steam separation are enclosed in one rectangular insulating box

water. We solved that by designing a staged attemperator, essentially consisting of a large unit for injecting a large flow during startup and a smaller attemperator for peak temperature shaving."

Development work was predominantly finished during the summer of 2007 with a final design review in Orlando, USA. The DrumPlus was then approved by Siemens as the standard solution for its Flex Plant 10 design and the first unit was sold for installation at El Segundo.

NEM was sufficiently confident in its design and simulations to go straight from its computer modelling to building a fully-fledged unit for El Segundo. "It was like with the B-2 plane," said Rop. "We tested everything in the computer and then went to site and built it."

There were however, contingency plans to allow for easy modifications or alternative solutions. "For example, for the water/steam separators we worked out designs for our favourite supplier as well as our number two. If the first solution did not work, we could easily use solution number two," said Rop.

NEM had to wait a few years to test its computer designs in the field. NRG's decision to change the original plant configuration resulted in a permitting delay and plant construction did not begin until 2010.

Once started, however, erection progressed smoothly. The El Segundo site is quite a compact site and boiler components were delivered to the laydown area in a sequence that supported the field construction.

"The external casing had to be there first and the bundles were then loaded into the boiler. Then you had your walkways, secondary steel, piping and things like that," noted Albert. "And obviously the HP steam drum arrived with modules."

During the erection phase, some basic changes were made to the controls – particularly the feedwater control. "It was an important modification but it worked out well," noted Rop.

According to NEM, the boiler performed even better than expected. "Circulation in the evaporator was very good. And the swell and shrink behaviour of the evaporator was not as violent as we expected," said Rop. "Of course we had to do some tuning, but not as much as anticipated and we never came close to the limits."

With less work needed for tuning the boiler, commissioning engineers were able to focus on tuning the gas turbine. According to Albert, the whole tuning process was expected to take a week or two but was successfully completed within a day.

Each of the plant's combined cycle units is permitted to start well over 200 times per year. Since the start of commercial operation in August last year, it has performed daily start-ups and shutdowns – sometimes as many as three times a day. Notably, NEM says the plant has been able to start up even faster than was required.

Albert said: "The units run according to the market. Some days they don't run but they really have to be available to run as needed. Since start-up, the plant has performed over 200 starts and stops.

"The operators may not get much warning on when the units are needed so they just want to know that they can push a button and the units will start reliably. The feedback from the plant has been positive with regards to the operation."

In addition to the obvious economic advantages of being able to bring units online quickly, the new units have drastically reduced El Segundo's emissions footprint. Consumption of potable water is reduced by nearly 90 per cent; it meets or exceeds the State and South Coast's strict air quality standards; and will use 30 per cent less natural gas per megawatt produced than the original steam boilers.

The boiler design allowed the use of a conventional selective catalytic reduction (SCR) and CO catalyst. This provides a plant that can operate like a peaker, with unrestricted start-up, but with a conventional SCR at the back. It therefore has the operating profile of a peaker but the emission footprint of a combined cycle.

According to Siemens, the entire plant can ramp up and down at 30-35 MW/minute while maintaining 2 ppm of NO_x out of the stack. Start-up CO emissions are reduced by 90 per cent compared to conventional CCGT plants as a result of the shorter start-up time. This, it says, is the equivalent of removing about 200 diesel trucks from the highway for about an hour – significant for a plant that starts up as often as El Segundo is designed to.

There is certainly significant interest in fast start combined cycle plants that can deliver this kind of performance. "We currently have proposals out there with different customers wanting to utilise the technology," noted Albert. In addition to El Segundo and the Lodi plant, also in California, Siemens has contracts to install several of its Flex Plant 30 units.

NEM will therefore be introducing dual and triple pressure units to the market. The company, which hopes to sell such units this year, says these will be capable of the same start times as El Segundo.

Interest in fast start technology is likely to grow as more wind and solar power feeds into the grid and impacts grid reliability. Indeed, solar could present a further opportunity for the DrumPlus HRSG, which could be used with solar receivers.

Looking further forward, the new generation of advanced gas turbines will also drive further development. "We are working on HRSG designs for the Siemens H- and Mitsubishi J-class machines. These will have even larger flows and larger pressure parts made from different materials," said Rop.

Geographically, with reduced power demand in Europe and especially challenging conditions for combined cycle plants, however, the immediate focus will be on the US market. As a boiler that helps to reduce emissions and offers the flexibility needed to accommodate an increasing influx of renewables, there seems to be no reason it should not gain wider acceptance in the future.

As Overduin put it: "If you are building a combined cycle plant, you need an HRSG anyway, so why not a DrumPlus to be ready for the future?"

Meeting California's requirements for flexibility: the new El Segundo installation features two combined cycle units with a total output of 550 MW

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GE eyes bigger role in energy storage

A global licensing and collaboration agreement between GE and UK-based Highview Power Storage looks set to accelerate the commercialisation of liquid air energy storage (LAES).

The agreement signed last month will see the two companies explore opportunities to integrate Highview's LAES systems in peaker power plants where GE gas turbines and gas engines are currently or will be installed to increase power plant efficiency, grid reliability and the distribution of renewable energy.

Highview's LAES technology uses liquid air or nitrogen as the storage medium to provide long-duration energy storage without the geographical restrictions found with other energy storage methods. The technology also can convert low-grade waste heat into power, increasing the overall efficiency of a host power plant.

In February this year, the UK Department of Energy and Climate Change awarded Highview and Viridor, a UK recycling, renewable energy and waste management company, more than £8 million ($13 million) to build a new 5 MW/15 MWh LAES demonstration plant at a Viridor landfill gas-to-energy plant in the UK.

The LAES facility will be powered by a GE Oil & Gas turbo-generator and will demonstrate the technology at commercial scale for the first time when it begins operating in the spring of 2015.

"Highview's readily available LAES technology, with its ease of implementation and access to an operational pilot plant, makes it an ideal partner for GE Oil & Gas," said Luca Maria Rossi, product management general manager for GE Oil & Gas Turbomachinery Solutions business.

"Working with GE is a great opportunity for Highview to access a broader customer base. The use of our LAES technology with GE's solutions for flexible peaker plants will help make a significant contribution to balancing the electrical network of the future," said Highview CEO Gareth Brett.

Change blows through wind company rankings

Recent data for wind turbine sales reveals mixed fortunes for global manufacturers, as Vestas regains its top spot.

Junior Isles

Wind turbine installation figures for 2013 released by research and consulting firm GlobalData's reveal mixed fortunes for global wind turbine manufacturers.

According to GlobalData's rankings, Danish wind turbine manufacturer Vestas Wind Systems has regained its position first place from GE as the world-leading turbine installer, in terms of total capacity installed.

Vestas' return to favour, following recent difficulties, is the result of a high number of wind turbine installations in the US. Last month the company announced that it was ramping up hiring in the US to handle orders of almost 900 turbines in 2013.

GE lost top position as it installed 980.2 MW of wind turbines in 2013 – over 80 per cent lower than its 2012 installed capacity, said GlobalData.

Gamesa also slipped out of the top five but returned to profit in 2013. Financial results published at the end of February showed the Spanish company ended 2013 with attributable net income of €45 million in 2013, compared with a loss of €659 million in 2012.

German turbine manufacturer Enercon, meanwhile, climbed from fourth position in 2012 to number two.

While Chinese OEMs were absent from the top five in 2012, Chinese wind turbine supplier Xinjiang Goldwind Science & Technology (Goldwind) advanced from seventh position in 2012 to third place in 2013.

Siemens slipped to fourth position in the rankings, as Goldwind overtook the company to claim its position from 2012. Siemens' fall follows its decline in US, UK and Romanian wind turbine installations.

Like Goldwind, Suzlon Group was another new entrant in the top five and ranked as the fifth largest OEM for 2013, advancing from sixth position in 2012. Despite a challenging year, the company installed more turbines in 2013 than in 2012, says GlobalData. Suzlon's latest figures show it booked 913 MW of new orders during the third quarter of 2013, aggregating nearly 1.7 GW over the first nine months.

Suzlon says it is "strategically positioning" the business to take advantage of new opportunities and as part of this is reorganising its India Operations and Maintenance Services vertically into a separate company.

■ On the basis of its provisional consolidated financial statements for 2013, sales of the Nordex Group rose by around 33 per cent to €1429.3 million. Last month, its guarantee credit facility was renewed until 2017 and increased to €550 million.

China steps into Malta

China and Malta have signed an energy deal that rescues the indebted Maltese energy utility and gives China a Mediterranean foothold in a future energy hub of the European Union.

The landmark agreement signed in March – the biggest foreign direct investment ever in Malta – gives the Shanghai Electric Power Company (SEP) a 33 per cent equity stake in the Maltese utility Enemalta for a price of €320 million ($432 million).

Enemalta's debt, which has stood at as much as €800 million, will be reduced to under €300 million with the deal.

The deal will also see the formation of two joint-venture companies: the first will invest in renewable energy projects for distribution in Europe, with a target of 300 MW over the next five years produced from wind energy and solar panels. The second joint venture will be a company to provide service to other Shanghai Electric power plants in Europe.

Renewables growth continues to erode utility model

■ RWE posts first loss in 60 years
■ GDF Suez declares net loss of €9.3 billion

Financial results show utilities such as RWE and E.On are continuing to see their traditional business model undermined by the growth of renewables.

Last month RWE reported a heavy net loss in 2013 – the German power utility's first in more than 60 years – after suffering billions of euros in write-downs as subsidised renewable energies continue to squeeze out its conventional power plants and erode wholesale electricity prices.

The company posted a net loss of €2.8 billion ($3.8 billion) compared with a profit of €1.31 billion a year earlier. RWE attributed it to €4.8 billion in impairment charges, mainly on its fleet of industrial-scale coal- and gas-fired power plants across Europe.

Many European governments have set up subsidy schemes for renewable energy partly to help achieve ambitious climate change targets. This has resulted in a capacity glut that has eroded wholesale power prices and the profitability of large base load plant, particularly gas fired power stations.

French utility giant GDF Suez also announced write-downs of €14.9 billion and declared a net loss for the full year of €9.3 billion, compared with a €1.5 billion profit the year before.

E.On, Germany's biggest utility, meanwhile, forecast a further steep decline in earnings this year. It warned that political decisions to favour renewable energy could threaten the region's energy security in the future, as it reported a 14 per cent drop in earnings for 2013.

German energy utility EnBW (Energie Baden-Wuerttemberg) also saw its net profit fall by nearly 90 per cent last year.

High gas prices, subsidised renewables and a weak economy also weighed on Czech utility CEZ, which reported that fourth-quarter net profit fell by almost 50 per cent on year.

In response to the worsening business environment, utilities are reducing costs and cutting thousands of jobs.

E.On has shut down nearly 13 GW of capacity, more than a quarter of its conventional fossil fuel and nuclear plant capacity.

Italian utility Enel plans to mothball a total of 8 GW of capacity mainly in Italy, but also in Spain, by 2016, 4.9 GW of which will be by the end of this year. Chief Executive Fulvio Conti said last month the company is ready to mothball further power plants if needed to safeguard its margins.

RWE said it has decided to mothball an additional 2.3 GW of generation capacity. This would bring the company's total capacity closures to around 6.6 GW.

RWE also confirmed a bleak outlook for 2014, saying it expects recurrent after-tax profit to fall by as much as 44 per cent on the year because of low power prices and the "green" energy glut.

Peter Terium, RWE's CEO, said: "We were late in entering the renewables market, possibly too late."

Areva turns corner

Areva says it "reached a major milestone" in 2013 in turning performance around by meeting a key objective of the Action 2016 plan: the return to breakeven of free operating cash flow.

Commenting on financial statements submitted by the Executive Board for the period ended December 31, 2013, Chief Executive Officer Luc Oursel said: "For the first time since 2005, cash generated by our operations allowed us to fully fund strategic capital expenditures essential to the group's profitable growth. To achieve this result, we built on robust growth in nuclear operations, on contributions from our cost reduction plan and on strict management of capital spending."

In the renewable energies market, in a situation marked by a reduction of capital spending by customers, Areva anticipated the consolidation required in the sector by implementing industrial partnerships such as the joint venture project with Gamesa, which aims to create a European champion in offshore wind.

■ Areva has selected Schneider Electric as its preferred supplier of power equipment for its offshore wind projects. This includes the 100 x 5 MW wind farm in the bay of Saint Brieuc off the coast of Brittany and the current tenders for the offshore wind farms at Le Tréport off the coast of Haute-Normandie and the islands of Yeu and Noirmoutier in Pays de la Loire (France).

Americas

Cape Wind signs transmission cables deal

Cape Wind Associates LLC, the company seeking to build the USA's first offshore wind farm in a decade, has contracted with Prysmian Cables and Systems USA to supply the transmission cables for the project.

The project in Nantucket Sound, which has faced several legal challenges, is still awaiting a decision from the US Department of Energy on whether it will receive a $500 million loan guarantee.

Cape Wind hopes to complete financing for the project in the third quarter of this year and begin upland construction by the end of the year

CG expands Paraguay network

Avantha Group Company CG has signed a contract with the state utility of Paraguay – Administracion Nacional de Electricidad (ANDE) – for the supply of 19 single- and three-phase transformers amounting to a total of 683.3 MVA, for expansion of the country's 220 kV network.

The company has also fulfilled delivery of the final lot of 8000 meters from an order to supply 30 000 advanced meters to monitor and boost the utility's performance.

The Paraguayan utility has a growing customer base but has been suffering from distribution losses, which are amongst the highest in the region.

Gamesa consolidates presence in Brazil

Gamesa has reinforced its presence in Brazil with two agreements to supply wind turbines to CER (Companhia de Energias Renováveis) and Ventos dos Guarás I Energias Renováveis.

The agreement with CER covers the supply, installation and commissioning of 34 G97-2.0 MW wind turbines at the Assuruá II, Assuruá V and Assuruá VII wind farms within the Xique-Xique wind complex. The machines are scheduled for delivery during the second quarter of 2015.

A similar contract with Ventos dos Guarás I Energias Renováveis covers another 15 turbines of the same model at the Ventos dos Guarás I wind farm in the Morrinhos complex. These will be delivered in the third quarter of next year.

Suzlon deploys Nexans cable solutions

Suzlon has turned to Nexans to support its projects in Brazil.

In two framework agreements with Suzlon, Nexans is supplying its WindLink LV and MV tower cables, site kits and accessories together with MV inter-array cables and HV export cables that form the connection to local substations.

The contract, worth around €11 million will ensure efficient and reliable connections for 150 wind turbine generators.

Minnesota Power orders enhanced turbines

Siemens Energy is to install 64 of its latest 3-MW D3 platform wind turbines at Minnesota Power's Bison Wind Energy Center near New Salem, North Dakota, USA.

The innovative direct drive wind turbines feature a 113 m rotor and 92.5 m hub height and thus increased rating of 3.2 MW.

The scope of supply includes transportation, installation and commissioning, as well as a three-year service and maintenance agreement.

Installation of the turbines is scheduled to begin in mid-June 2014, and commercial operation is slated for December 2014.

Asia-Pacific

1MDB awarded Project 3B

Government-backed 1Malaysia Development Bhd (1MDB) has won the tender to build the 2000 MW coal fired power plant called Project 3B.

1MDB outbid early favourite YTL Power International Bhd for the RM11 billion ($3.32 billion) project.

The Energy Commission selected the consortium of 1Malaysia Development Bhd-Mitsui Co Ltd (1MDB-Mitsui) to build, own and operate the power plant in Jimah, Negri Sembilan, at a levelised tariff of 25.33 sen/kWh (US7.55 cents/kWh).

BHEL orders 2 x 800 MW supercritical boilers

Bharat Heavy Electricals Limited (BHEL) has awarded Alstom a €85 million contract for two 800 MW supercritical boilers for the Darlipalli super thermal power project (STPP) located in Sundergarh, in the State of Odisha (India). This project forms part of NTPC Ltd's Bulk 800 MW tender.

Under the contract, Alstom will design the 800 MW supercritical boilers and supply identified pressure parts along with windboxes, pulverisers and airpreheater components.

Commissioning of the units is expected to start in 2017.

Hyundai signs Sri Lanka deal

Hyundai Amco, a Hyundai Motor Group construction company, has signed a cooperative agreement with Sri Lanka Gateway Industries to build a $730 million coal fired power plant in Trincomale, Sri Lanka.

Over the next two years, Hyundai Amco and the Sri Lankan company will build the 500 MW power plant, which they will operate on behalf of the Ceylon Electricity Board.

The two companies will sign a memorandum of understanding with the state-run company in September this year at the earliest, followed by the main contract next year.

Pestech inks power line deal

Pestech International Bhd, of Malaysia, has sealed a $86.05 million contract to build a 198 km power transmission line from the Sihanoukville area to Phnom Penh city, Cambodia.

An agreement signed by its subsidiary Pestech (Cambodia) Ltd and Alex Corporation Co. Ltd of Cambodia will see the design, installation and commissioning of the 230 kV west Phnom Penh-Sihanoukville transmission line and a substation extension project.

Alstom secures Korean wind turbine contract

Alstom has been awarded a contract by GS Engineering & Construction (GS E&C) to provide wind turbines for Gimnyeong wind farm located in Jeju Island, Korea.

Under the contract, Alstom will supply and supervise the installation and commissioning of 10 units of its ECO 110 onshore wind turbines, each with an output of 3 MW.

The Gimnyeong wind farm, which will be operated by SPC "Gimnyeong wind power", will be fully operational by the end of 2014.

Europe

Voith to modernise Zvornik hydropower plant

Voith Hydro is to modernise the Zvornik hydropower plant on the River Drina, Serbia. Voith Hydro St. Pölten is replacing four generators and four Kaplan turbines, as well as the automation systems and mechanical and electrical ancillary equipment.

The contract signed in autumn 2013 is now coming into effect. The €65 million ($90 million) order was placed by energy supplier, Elektroprivreda Srbije.

Vestas wins German order, signs framework

Vestas and German wind power plant developer juwi have signed a framework agreement for 75 units from Vestas' 3 MW platform, with an order for 21 MW now firm and unconditional.

The firm order consists of seven V112-3.0 MW turbines to be installed in Rhineland-Palatinate during the third quarter of 2014. The remainder of the turbines are expected to be delivered and installed within 2014 at sites in Western, Central and Southern Germany.

Hitachi-led consortium wins Polish contract

Poland's biggest utility group PGE has awarded a Hitachi-led consortium a 3.25 billion zlotys ($1.07 billion) contract to build a new coal fired power unit in southeast Poland.

The new unit at PGE's Turow plant is designed to replace older units in five years. The consortium selected to build the 430-450 MW unit comprises Hitachi Power Europe , MHPS Europe, Tecnicas Reunidas and Budimex , a Polish unit of Spanish firm Ferrovial .

Magnox selects NEC as preferred contractor

NEC has been selected as the preferred contract supplier for Magnox Limited for its decommissioning programme of some of the UK's nuclear power stations on behalf of the Nuclear Decommissioning Authority.

The contracts allow Magnox to work with suppliers over a period of time rather than for single specific projects.

In 2010 Magnox rationalised its supply chain using common NEC3 terms of engagement. The aim is to improve performance by reducing complexity and duplication.

New substations for Svenska kraftnät

Svenska kraftnät, the Swedish National Grid operator, has awarded ABB a $45 million contract for the supply of three 400 kV substations.

The Sege 400 kV substation in southern Sweden will be replaced to improve grid reliability and supply quality power to the city of Malmö and to the Skåne region. In northern Sweden, two new 400 kV substations, Djuptjärn and Högnäs, will secure power supply to the city of Kalix. Högnäs, will also enable the integration of wind energy to the national grid in the Västerbotten region.

GE secures Brilliant orders

GE has announced 110 MW of orders to supply some of Germany's newest wind farms with its Brilliant 2.5-120 wind turbines. It will supply a total of 44 GE 2.5-120 wind turbines for eight new German wind farms.

A large majority of the orders also include long-term full service agreements.

The 2.5-120 is GE's first Brilliant wind turbine to utilise the power of the Industrial Internet, which analyses tens of thousands of data points every second to drive higher output, improve services productivity and create new revenue streams.

International

ABB to boost Saudi grid

ABB has won an order worth around $110 million from the Saudi Electricity Company (SEC) to construct substations that will help boost transmission capacity in the country's western region.

The new substations will link the Taif East Governorate, a part of the Mecca region, to the national 380 kV transmission grid. The 110 kV power supply enabled by the substations will serve the settlements of Turbah, Al-Khurmah and Rania, mitigating the use of diesel-generated power in isolated areas.

The turnkey order includes design, supply, installation and commissioning of a 380/110 kV bulk supply point substation and the expansion of the existing remote-end substations in Bisha and Sised to support the 380 kV grid interconnection.

ABB also announced an order worth around $30 million from SEC to refurbish FACTS systems in the Eastern Operating Area.

Algeria awards power plant contracts

Samsung C&T has won a $1.37 billion EPC contract to build two power plants for Sonelgaz Electricity Production Company (SPE), a subsidiary of Algerian state-owned electricity and gas utility group Sonelgaz.

The plants will be located in Mostaganem and Nama. The power station in Mostaganem will have a capacity of 1450 MW and the one in Nama, 1163 MW.

Algeria plans to build six new combined cycle power plants by 2017 to meet growing electricity demand. Samsung C&T has been selected to construct two out of the six planned plants.

Meanwhile, Siemens Energy is to supply two gas turbines and two generators to Hanwha Engineering & Construction Corporation from South Korea for a new 460 MW simple cycle power plant in Biskra, Algeria.

Siemens' scope of supply includes two SGT5-4000F gas turbines, two SGen5-1000A generators as well as technical field assistance during erection and commissioning.

Siemens will also provide spare parts for the components under a 10-year parts supply agreement. Commissioning is scheduled for August 2014.

Saudi gets energy market management system

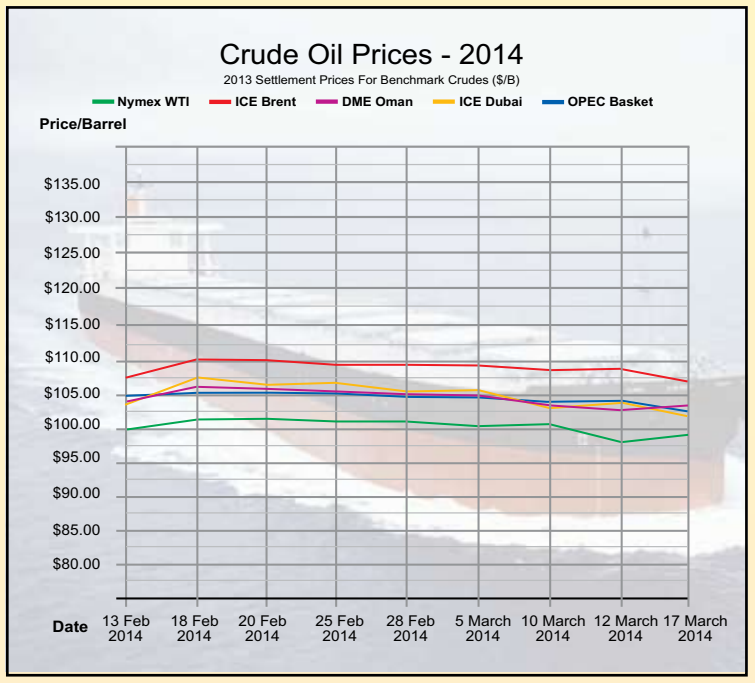
Alstom Grid has been awarded a €38 million contract by National Grid SA, in Saudi Arabia, to provide its Network Management Solutions (NMS) for the National Control Centre (NCC) in Northwest Riyadh. This will create the first ever energy market management system in the Middle East and ultimately bring about an electricity wholesale market between various stakeholders. The first phase is scheduled for delivery 2015.

The new Energy Management System (EMS) will interconnect the existing four regional control centres and will provide interconnection with other Gulf countries through the Gulf Cooperation Council Interconnection Authority.

Oil

Crude markets pay scant attention to Ukraine events

- Russia and West closely linked in producer-consumer relationship
- Europe received over a third of its net crude imports from Russia



David Gregory

Crude oil prices remained in their relative orbits in late February and March during the crisis in Ukraine and the subsequent annexation of Crimea by Russia. There were some shifts in prices during the course of events, but with Crimea's return to Mother Russia and Moscow unfazed by the meager sanctions leveled so far against it, crude prices went about their business, impervious to events in Eastern Europe and seemingly more concerned with US crude stocks and the state of China's economy.

West Texas Intermediate (WTI) crude in mid-March averaged just under $100/b, having also reached $105/b during the height of the crisis. Brent in mid-March settled at under $107/b and nearly reached $112/b when the tables turned in Kiev.

The price of WTI was logged just below $100/b with news that the Seaway pipeline, which will have the capacity to transport 850 000 b/d from Cushing, Oklahoma, to the US Gulf Coast, will come into operation in late May or early June, a month before anticipated. New pipeline infrastructure in the US is expected to close the gap in the price differential between WTI and Brent.

Building US crude production has caused inventories to climb in Cushing, where the price of WTI is set. The Seaway pipeline will serve to unclog the bottleneck and ease crude flow to the Gulf Coast refiners.

The Paris-based International Energy Agency (IEA) said in its March 11 *Oil Market Report* that aside from a brief and short-lived spike in oil prices on March 3, the oil market has so far taken the standoff between Russia and the West over Ukraine in its stride.

"One factor in the market's relative calm is almost certainly the fact that Ukraine is not a major transit country for Russian-origin oil sold to the West," the IEA said. It pointed out that despite Russia's gradual redirection of some crude from the Atlantic to the Pacific, "Russia and the West are closely linked in a producer-consumer relationship that remains very important to both parties."

During 2013, OECD Europe still received as much as 36 per cent of its net crude imports from Russia, which in turn relied on Europe for 71 per cent of its crude exports, the IEA said.

The US Energy Information Administration (EIA) said in the March release of its *Short-Term Energy Outlook* (STEO) that Brent averaged a price near $110/b during February for the eighth consecutive month. WTI rose by $6/b from January to average $101/b in February.

The administration said it expects the price of Brent to weaken as non-Opec supply growth exceeds growth in world consumption and projected that it would average $105/b in 2014 and $101/b in 2015.

WTI is projected by the EIA to average $95/b in 2014 and $90/b in 2015.

The report projected that world petroleum and liquids supply would increase by 1.3 million b/d in both 2014 and 2015, and that most of that growth would come from non-Opec countries, particularly the US, Canada and Brazil.

Total world supply averaged 90.33 million b/d in 2013, the EIA said, forecasting supply at 91.67 million b/d in 2014 and 93.00 million b/d in 2015.

World consumption averaged 90.38 million b/d in 2013, and the EIA expects to see consumption grow 1.2 million b/d in 2014 to 91.60 million b/d and by 1.4 million b/d in 2015 to 92.97 million b/d.

Meanwhile, with most of the world focused on Ukraine, Crimea, Moscow, Brussels and Washington, there was drama on the high seas. A tanker of mysterious origin arrived in Libya's Es Sider port, where rebels loaded the vessel with 20 000 tons of crude. The tanker managed to evade Libya's 'navy' and set sail for an unknown destination.

The vessel was boarded by US Navy Seals southeast of Cyprus and rebels onboard the craft were apprehended. US seamen then set the tanker on a course for a Libyan port under the control of the government.

US intervention in the attempt by Libyan rebels to export crude outside of government control and thus finance a self-proclaimed autonomous region in eastern Libya is seen as having pre-empted any future attempt by the rebels to smuggle Libyan oil.

Gas

Russia expands Black Sea energy realm with Crimean annexation

With Crimea now officially part of Russia, the offshore hydrocarbon deposits in the Black Sea and Sea of Azov that once belonged to Ukraine, now lie within the domain of Gazprom and other state-owned Russian oil and gas companies.

Mark Goetz

The Crimean parliament moved quickly last month to seize Ukraine's state-owned energy companies Chornomornaftogaz and Ukrtransgaz, the upstream production and transport firms respectively. The two companies are now the 'Crimean Republic Enterprises' and are under the control of the new Russian republic's Ministry of Fuel and Energy. The parliament also took control of the state-owned oil products company Feodossiya.

A statement issued by the parliament said the decision to take control of the companies was made "to secure environmental and energy security of the Republic of Crimea and establishing conditions for production, storage and transportation of hydrocarbons in the Republic as well as supplying the residents of Crimea with energy resources".

Chornomornaftogaz, is a Crimea-based subsidiary of Ukraine's state-owned energy company Naftogaz Ukrayiny. It is the only producer of oil and gas in the Ukraine's section of the Black Sea and is operator of three fields in the Sea of Azov. Practically all of the gas it produces goes towards meeting demand within Crimea, but it is hooked into Ukraine's gas network. The company produced 1.65 billion m^3 of gas in 2013, up by 40 per cent over 2012 after two new drilling rigs were deployed at the Odesske and Bezimenniy fields in the Black Sea.

According to Russia's ITAR-TASS news agency, there are 26 hydrocarbon deposits onshore Crimea and eight offshore in the Black Sea with proven reserves totalling 15 million tons of oil equivalent. The agency said that large hydrocarbon deposits exist within the Kerch area. Media reports in the Western press cite large gas deposits in the Sea of Azov and large fields southeast and west of the peninsula.

The country's offshore natural gas resource had been estimated at between 4 and 13 trillion m^3 (tcm). To develop them to a production rate of around 9 billion m^3 (bcm) per year by 2030 would require an investment of about $9 billion.

Ukraine had made plans to begin new exploration programmes in the Black Sea with a number of foreign energy companies.

Those plans for further energy exploration and development have in recent weeks been taken over by Russia. Russian Prime Minister Dmitry Medvedev was reported by *RIA Novosti* on March 24 as saying that Russian companies could double gas production in Crimea over the next few years in order to secure the area's energy independence from Ukraine. Crimea relies on Ukraine for 80 per cent of its electricity supply.

During a meeting in Moscow to discuss social and economic development in Crimea, Medvedev said that Russian gas giant Gazprom had already laid out plans for energy development in the peninsula. He said the planned increase in gas production should cover Crimea's electricity demands. "Gazprom has an initiative for this," Medvedev was quoted as saying.

Medvedev said that Crimea's dependence on water and electricity is an infrastructural problem that needed to be addressed. Options include building a power station in the peninsula or laying down electricity and water lines from Russia's Krasnodar province.

In Ukraine, the national guard and security services were ordered by the new prime minister to take full control of the natural gas pipeline system that transmits Russian gas to Europe. A statement issued by the interior ministry said the move was taken to ensure the safety and smooth running of the "country's most important infrastructure facilities".

Ukraine's right-wing paramilitary Right Sector had threatened to destroy the pipelines if Russia invaded.

Meanwhile, Ukraine authorities arrested Evgeny Bakulin, the head of Naftogaz Ukraininy, on suspicion of grand larceny and a court set bail at $142.1 million, *Interfax* reported in late March. A number of other officials in Ukraine's energy sector have been dismissed as investigations into the running of the country's energy sector get underway.

Bigger questions surround the fate of Ukraine and its future relations with Russia. Will it continue to play its role as main gas transit state between Russia and Europe? And can Europe provide the massive amounts of economic assistance that Ukraine will need to align itself with Europe?

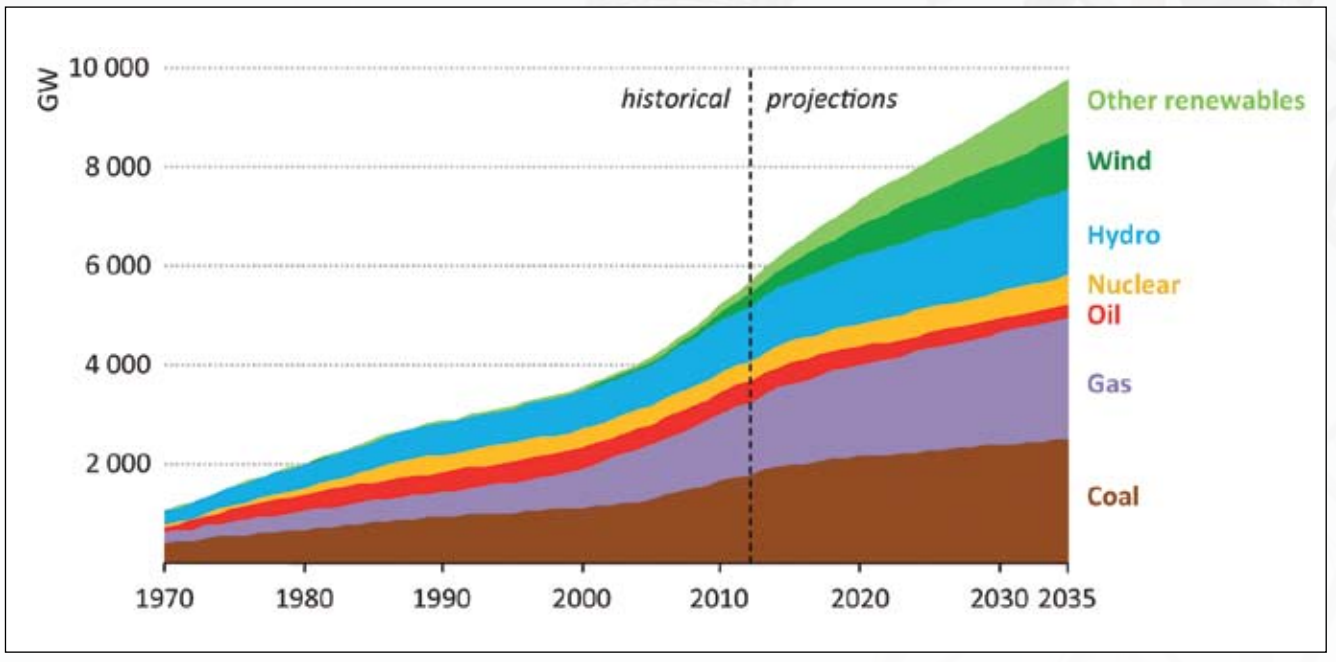
In hindsight, the crisis in Ukraine has been in the making for a long time. Its resolution will also be a long time coming.

Electricity generation by source and scenario (TWh)

			New Policies		Current Policies		450 Scenario	
	1990	2011	2020	2035	2020	2035	2020	2035
OECD	**7 629**	**10 796**	**11 827**	**13 104**	**11 990**	**13 835**	**11 415**	**12 123**
Coal	3 093	3 618	3 529	2 775	3 681	3 835	2 961	1 116
Gas	770	2 630	2 855	3 398	2 979	3 710	2 813	2 307
Oil	697	345	149	84	153	92	126	44
Nuclear	1 729	2 087	2 300	2 412	2 273	2 246	2 355	2 826
Hydro	1 182	1 388	1 490	1 615	1 476	1 586	1 523	1 730
Other renewables	157	728	1 504	2 820	1 428	2 367	1 637	4 099
Non-OECD	**4 189**	**11 317**	**16 172**	**23 983**	**16 799**	**26 018**	**15 139**	**20 173**
Coal	1 333	5 522	7 089	9 537	7 901	12 296	6 043	3 544
Gas	960	2 217	3 128	4 915	3 242	5 463	2 958	3 686
Oil	635	717	652	472	666	522	578	278
Nuclear	283	497	1 100	1 881	1 049	1 668	1 191	3 011
Hydro	963	2 102	3 065	4 212	2 936	3 891	3 144	4 665
Other renewables	15	263	1 138	2 965	1 004	2 177	1 225	4 989
World	**11 818**	**22 113**	**27 999**	**37 087**	**28 789**	**39 853**	**26 554**	**32 295**
Coal	4 426	9 140	10 618	12 312	11 582	16 131	9 004	4 660
Gas	1 730	4 847	5 983	8 313	6 222	9 173	5 771	5 993
Oil	1 332	1 062	801	556	819	614	705	323
Nuclear	2 013	2 584	3 400	4 294	3 322	3 914	3 546	5 837
Hydro	2 144	3 490	4 555	5 827	4 412	5 478	4 667	6 394
Other renewables	173	992	2 642	5 785	2 432	4 544	2 861	9 089

World Energy Outlook 2013 © IEA/OECD, Page 175, Table 5.3

Installed capacity by source in the New Policies Scenario



World Energy Outlook 2013 © IEA/OECD, Page 177, Fig 5.4

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Source: World Energy Outlook 2013

Getting a foot in the door

The Baltic region is firmly integrated with the European house. However, its power systems are just beginning to move beyond the doorstep. **Przemek Luczynski** and **Joscha Schmitz** of Baringa Partners explain the key issues arising from the complex transition.

Lithuania, Latvia and Estonia continue to progress in the field of energy market integration. However, despite being politically and economically integrated since joining the European Union (EU) in 2004, the countries of the Baltic States continue to rely heavily on gas and power imported from Russia. This continues to spur on market reforms and the region's drive to connect its infrastructure to the rest of Europe.

To better understand the current situation of the Baltic States, it is important to consider that the power system of the three republics was originally designed and built as an integral part of the Soviet Union's power system. This is why the Baltic States remain heavily reliant on Russia's power system today.

The situation has been acknowledged by the EU which, in order to facilitate the Baltic States' integration, is supporting the development of new power interconnections. While this is a significant development for the Baltic States, the implementation of new power interconnections is a heavily protracted process. It took 17 years to establish the first interconnector with a western country after the Baltics States broke their political ties with Russia, with the first power link with Finland finally being put into operation in 2007.

That said, existing strong interconnections with Russia and Belarus helped, and indeed still help, to maintain uninterrupted power supplies in the region. Since the major baseload provider, the Ignalina nuclear power plant in Lithuania, was closed at the end of 2009, the interconnectors help keep the lights on.

The closing of the Ignalina nuclear power plant was a game changer for Lithuania and the region as a whole, which overnight became a net importer of electricity. Since 2010, Lithuania has covered on average 50 per cent of its electricity needs by import, mainly from Russia and Belarus.

Meanwhile, the generation mix in the Baltics is diverse. Lithuania depends on imports supported by gas fired generation at the Lithuanian Power Plant, with a new combined cycle gas turbine (CCGT) unit added in 2012, combined heat and power (CHP) plants in major cities, and significant pump storage capacity at the Krounis plant.

The proposed Visaginas nuclear power plant located at the closed Ignalina site would significantly change the outlook for Lithuania. However, the project is still awaiting the final investment decision. The project development was hit by the negative outcome of the 2012 referendum and, as such, no significant changes are expected in terms of internal electricity generation in the short term. It is uncertain if this new nuclear project will ever get off the ground.

Latvia relies primarily on the hydro potential of its Daugava River, supplemented by a recently refurbished gas plant in Riga. Historically a net importer, Latvia's incoming flows came mainly from Lithuania up until 2010, and now from Estonia.

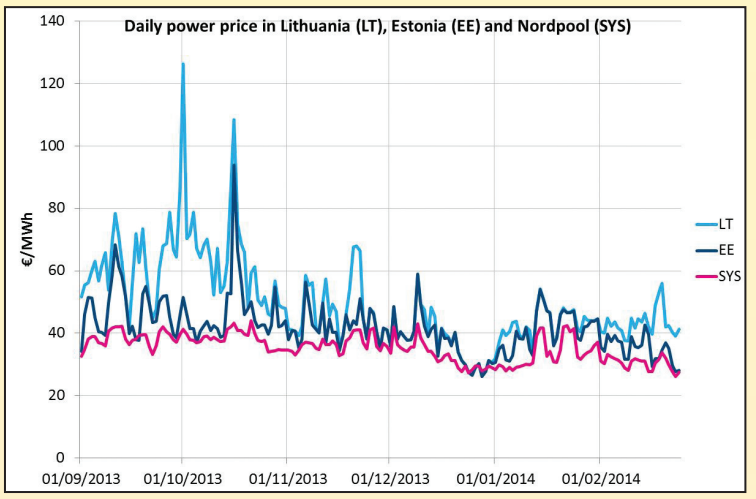
Domestic reserves of oil shale guarantee Estonia's energy independence, yet the lack of diversification threatens its long-term security of supply due to environmental constraints. Oil shale's low quality fossil fuel characteristics make Estonia's power sector the most carbon intensive in Europe.

This abundant and low-cost energy source guarantees the competitiveness of the Estonian power sector, but for how long is uncertain. The fact that Estonia plans to develop new refining capacities for shale oil (extracted from oil shale), thus introducing competition and raising market prices for the fuel, further adds to the pressure on power generators.

Estonia is currently the only country in the Baltics that has an electricity connection with another EU country, and the only one that is self-sufficient in terms of electricity generation. Estonia's integration with Nord Pool became possible after the commissioning of Estlink in 2007. Although there was only one power link between the Baltics and Scandinavia, today all three countries are part of the Nord Pool exchange. The first country to join was Estonia in 2010, followed by Lithuania and Latvia in 2012 and 2013, respectively.

Integration has recently picked up pace and the second interconnection was put into operation in February 2014. Estlink 2 has a capacity of 650 MW, almost tripling the capacity between Estonia and Finland, while a further two links are being developed to connect Lithuania with Poland and Sweden. The first one, called 'LitPol Link', will be a 500 MW overhead line and is expected to come online by the end of 2015. Following a similar timeframe, a subsea cable with a capacity of 700 MW is expected to connect Lithuania and Sweden.

By the end of 2015, 1200 MW of additional cross-border capacity is expected to be in place and will significantly boost the region's integration with the power system of northwest Europe. However, full integration will only be complete upon synchronisation with the European Continental Network, which the countries are striving to achieve before 2020.



The current pricing gap between the Baltic markets and Nord Pool will narrow in the future but fail to disappear completely

The relationship between interconnection and domestic generation capacities is reflected in the wholesale power prices in the region. Power prices in Lithuania are on average the highest in the Nord Pool market due to high generation costs. Latvian prices follow the Lithuanian market because there is sufficient interconnection capacity between the two countries. Network constraints between Latvia and Estonia put Lithuanian and Latvian prices at a premium against Estonia. Finally Estonia, thanks to Estlink, connects the remaining two republics and the rest of Nord Pool.

Recent research from Baringa Partners shows that the current pricing gap between the Baltic markets and Nord Pool will narrow in the future, but fail to disappear completely. The Baltics' integration with Nord Pool will become a reality in the future as interconnectors shift imports from East to West.

Yet even with imports from Nord Pool, the Baltic countries are fundamentally short in capacity. This is because the existing capacity mix is insufficient to meet demand in an affordable way amid the landscape of increasing fuel and carbon prices.

The research also highlights the potential for an additional 1 GW of base load generation beyond 2020, rising to 1.5 GW by 2030. This especially holds for Estonia, where shale oil resources may not guarantee competitiveness of the local power market in the long run, especially if new refining capacity increasingly competes for the same oil shale resource.

If significant new capacity is not commissioned, and in light of increasing demand and retiring of old plants, the region will experience very tight capacity margins and dependence on imports, but this time from the West as opposed to the East.

Electricity market integration is in the advanced stages and will be completed in the coming years. However, the fact remains that the progress of gas market integration with the EU is lagging behind due to a continued lack of physical connections. The Baltic States have no gas interconnection within the EU, and Russian gas company Gazprom is the only gas supplier to the region. This situation indicates significant security of supply concerns and high gas prices in the region.

Lithuania is especially affected, since it not only relies on electricity, but also on gas imports, making it one of the highest dependency countries on energy imports in the EU (>80 per cent). Dependency on energy imports will not shift in the short-term. The Baltic States failed to co-operate in the development of one regional LNG terminal, and the two remaining republics are pursuing their own LNG projects.

Nevertheless, the situation should improve, with the construction of an LNG terminal in Klaipeda expected to be complete by the end of 2014. Importantly, this will diversify supply. Moreover, the Baltic States are considering potential gas interconnection with EU members in order to diversify gas supplies, with Estonia developing a project with Finland (Baltic-connector), and Lithuania developing a project with Poland.

Although the assimilation of the Baltic power markets with that of the EU will be bolstered by significant upgrades to physical interconnections in the coming years, the gas market is set to remain relatively isolated from the EU for the foreseeable future.

At the same time, Russia will continue to dominate gas supply in the Baltic region, and this poses major challenges for Lithuania, Latvia and Estonia in the form of high gas prices and security of supply.

LNG terminals and interconnections will not alleviate high dependency on gas imports, but will create a greater diversity of supply, therefore increasing market security and eventually helping to reduce gas prices in the region.

Schmitz: the gas market is set to remain relatively isolated from the EU

Luczynski: even with imports from Nord Pool, the Baltic countries are fundamentally short in capacity

Russia may learn law of unintended consequences

Russia's action in Crimea could lead to a shift in global energy markets that puts more power in the hands of Europe, Ukraine and the US, argues **Chris Faulkner.**

Because the Ukraine is the gas hub for all of the European Union, there has been a lot of anxiety over escalating tensions affecting natural gas supply from Russia. While a major conflict would surely reverberate throughout Europe, is the current situation truly cause for worry?

Timing has a lot to do with answering that question.

Because the situation arose toward the end of winter, demand for natural gas from Russia is falling and will continue to fall. This helps protect Europe from any immediate threat of shortages or price spikes. Good news after nearly running out of gas the previous two winters in a row.

In addition, many European countries have worked at improving their reserves, so supplies had not yet been depleted when the conflict over Crimea arose. This additional level of protection is the result of concerted efforts made in the wake of deliberate stoppages in 2006 and 2009 during disputes between Russia and Ukraine.

It helps, too, that this has been the mildest winter since 2008, reducing Europe's need for gas to its lowest level since 1999. From a high of 50 to 60 per cent in the early part of this century, Europe's gas imports from Russia are now down to 25 to 30 per cent. The UK is on the brink of a 12-year low in gas consumption.

This reduction in consumption has helped Europe beef up its reserves to the point that Gas Infrastructure Europe has estimated that Europe has managed to store 10 per cent more gas this year and the UK about 25 per cent more than it normally has on hand at this point in the year.

Europe has also protected itself through additional pipelines. Even if Russia cuts off pipeline supplies to Ukraine, Europe can still receive gas via the North Stream pipeline in the near term, and via the new South Stream pipeline as soon as next year. New pipelines have cut the amount of Gazprom's exports that travel through Ukraine by about half, so only about 15 per cent of Europe's gas now arrives via Ukraine's pipelines.

Then there's the potential economic fallout for Russia. The value of the ruble already declined in the immediate wake of Russia's actions in Crimea, and Russia's credit rating has been downgraded. At the time this article was written, the United States had placed sanctions against 16 top Russian officials and others linked to the Russian government, including President Vladimir Putin, his Chief of Staff Sergei B. Ivanov, a personal banker, and a billionaire investor who has close ties to Putin. The EU had also placed its own sanctions against 33 Russian officials and others. The US also froze assets at Bank Rossiya, rendering it unable to conduct business in US dollars and freezing assets in related European banks. Additional sanctions may yet be imposed.

It is true that economic sanctions have a varied history of success: US economic sanctions against Cuba are famously and widely considered a failure; however, more recent sanctions against Iran have helped world leaders bring Iran to the table for talks of nuclear inspections.

Russia has already responded to US and European sanctions with retaliatory sanctions of its own.

This has the nervous nellies amongst us worried about potential economic fallout for the US, Europe and other major economies, but Russia has a very thin line that it must tread to avoid far worse economic consequences for itself.

For starters, Europe is Russia's top trade partner, but the reverse is not true. Russia ranks as Europe's third largest trade partner. Add to that the fact that the Russian economy is heavily reliant on its gas and oil exports to Europe. Cutting off supplies to Europe makes as much sense as cutting off one's nose to spite one's face.

European consumers boost the Russian economy by about $100 million per day, or about 3 per cent of the country's economy. Oil and gas exports to Europe have been an economic salvation for Russia, representing 70 per cent of Russian exports and about 7 per cent of its economy. The fact of the matter is that Russia needs its European exports more than Europe does.

Analysts, including the consulting and research firm IHS, have said it is unlikely that Russia will cut off supplies to the Ukraine or Europe.

Faulkner: Russia's aggressive action leaves the country teetering on more than one front

> Cutting off supplies to Europe makes as much sense as cutting off one's nose to spite one's face

Russia's aggressive action leaves the country teetering on more than one front. Indeed, it may be providing just the push that the Ukraine, the UK, and the US need to accelerate their own efforts at increasing their energy security.

Ukraine doesn't have a lot of power in the current situation. If it elects to block access to its pipelines, Russia can re-route its exports. However, Ukraine is sitting atop a quarter of the world's proven natural gas reserves, with major oil and gas companies already working to develop them. Europe, too, has come to Ukraine's rescue regarding its debts to Russia, which Putin has already threatened to use as just cause for canceling discount contracts with Ukraine.

The UK has its own massive reserves. The Energy Information Administration has estimated that the UK has nine times more technically recoverable shale gas resources than it annually consumes. While naysayers have noted the geological and geographical differences between the US and the UK that could limit the UK's ability to achieve an American-style energy boom, the fact is that the UK could fuel itself for 50 years on just 10 per cent of the reserves in the Lancashire area alone.

Europe holds another trump card: it can block Russia's South Stream pipeline, connecting the Black Sea and Southeastern Europe, in response to Russia's current or any future action. The European Commission and Russia had already been in negotiations over the pipeline, which have now effectively halted.

So, it should be no surprise that the UK and the US have been showing signs of more urgency with regards to their shale resources since Russia began its bid to annex Crimea from Ukraine.

In the UK, a large collection of university economics professors has called on politicians of all parties to support immediate responsible development of shale gas resources to help maintain the UK's economic recovery, along with thousands of jobs, export-led growth, and tax revenues.

Likewise, in the US, oil and gas companies, along with politicians, have increased pressure on the federal government to speed natural gas export permits. US natural gas exports are unlikely to undercut Russia in the form of exports to Europe, but in the form of reducing Russia's stronghold on the pricing of gas and supplies to Europe. America's shale gas boom has already impacted the global market and created competition for Russia.

In a surprise move that the White House has said is not related to the crisis in Ukraine, the US issued its first release of crude oil from its emergency stockpile since 1990, to the tune of 5 million barrels, in mid-March. Despite the administration's protests, this test sale of crude from the strategic reserve happens to come at a time when the US is well supplied and not in need of tapping into its own reserves. It also happens to be just enough to telegraph a clear message to Russia, whose economy has been so heavily driven by its oil and gas exports.

Europe does not have to look to the US for gas imports. It can import liquefied natural gas from nearer nations such as Qatar, and has been installing specialist terminals to do just that. In the meantime, Norway has overtaken Russia as Europe's top source of exported gas – another response to Russia's cruel games in 2006 and 2009.

In the end, maybe Putin has done the US, Ukraine, and Europe a favour. His actions today could lead to a shift in global energy markets that puts more power in their hands while undercutting Russia's long-held and deeply cherished ability to wield terrifying influence via the strength of its energy exports.

Chris Faulkner is the Founder and CEO of Dallas-based Breitling Energy Corporation (BECC), an oil and natural gas exploration and production company. Mr. Faulkner also serves as an advisor to the ECF Asia Shale Committee and sits on the Board of Directors for the North Texas Commission.

Demonstrating the value of bioenergy

Bioenergy offers significant opportunities to improve fuel security and reduce carbon emissions, but there are complex barriers threatening its growth. A versatile new pyrolysis technology could provide the answer, writes **Siân Crampsie**

As governments across Europe grapple with the creation of a coherent and stable energy and climate policy, the biomass sector is growing confident that it can play a leading role in meeting targets beyond 2030.

While much focus in the energy sector is centred on growth in wind and solar, biomass remains the single most important source of renewable energy in the EU.

According to Eurostat, biomass accounts for just over two-thirds (67.6 per cent) of primary renewables production in the EU in 2010. And although hydropower is the single largest source of renewable electricity generation in the EU, the quantity of electricity generated from biomass more than trebled between 2000 and 2010.

Biomass in 2010 accounted for 18.9 per cent of electricity generated from renewable sources, third-placed behind wind with a 21.8 per cent share and hydropower with 58.4 per cent.

It is not hard to see why biomass has been a European success story. Biomass is, in varying quantities and qualities, present almost everywhere, making it a secure indigenous source of energy that can replace fossil fuels and reduce dependency on energy imports. It can be sourced from a variety of supplies, ranging from dedicated forestry and energy crops to agricultural byproducts and industrial wastes.

In addition, biomass is the only renewable fuel that can fix carbon. It can produce energy more reliably than some renewable sources – particularly wind energy – and can be processed into a variety of forms suited to use in a wide variety of applications, including the aviation sector, where energy-intensive fuels are a must.

Countries such as Finland, Austria and Sweden have been particularly successful at exploiting biomass in both electricity and heating, combining thriving wood processing sectors with supportive government incentive schemes. In other countries the support for biomass has been less consistent.

Energy firms in the UK have in particular been critical of government policy. In March, RES cancelled plans for the construction of a dedicated biomass power station in north east England, saying that the government's "inconsistent support for dedicated biomass energy over the last two years" had "critically undermined the investment case" for its proposed development.

According to RES, biomass has "great potential" as a low-carbon, base load fuel but said in a statement that government policy had marginalised the technology by introducing a cap on dedicated biomass. "The cap represents a radical downsizing in government ambition for the technology from a target of 4000 MW in 2011 to a cap of 400 MW in 2013," said the firm.

The biomass sector says that government support is still required because in many cases the cost of bioenergy technologies remains high. In addition, developers face challenges in establishing a reliable fuel supply chain, and helping financial backers to understand the risks and complexities of biomass feedstocks.

Countries such as the UK do not have enough land to grow energy crops, or a large forestry industry from which to source biomass feedstock. This means that dedicated biomass energy projects often need to import biomass from abroad in order to ensure a secure supply of fuel, and this raises questions about the sustainability and carbon neutrality of biomass.

An alternative to importing feedstock is to use residues from a variety of domestic industries, such as agriculture or food processing, but this has added challenges of having to take into account factors such as growing cycles and harvest times and dealing with a variety of fuel types and qualities.

Accurate modelling of these risks is essential to the success of biomass schemes, according to Professor Tony Bridgewater, Director of the European Bioenergy Research Institute (EBRI) at Aston University.

EBRI is an EU centre of excellence in applied bioenergy technology that not only researches scientific and technological aspects of bioenergy production, conversion and utilisation but also advises businesses in the UK and internationally on using bioenergy.

EBRI last year began demonstrating the value of bioenergy when it commissioned its own in-house biomass fired combined heat and power (CHP) plant based on a first-of-its-kind pyrolysis technology called Pyroformer.

The Pyroformer is able to transform organic wastes and residues into heat, power and other marketable products. It is able to handle a wide variety of feedstocks, including hard-to-treat materials with a high water content, and therefore offers a potential solution to some of the feedstock risks faced by the bioenergy sector. Waste streams including sewage sludge, husk from rice, wheat, barley, oil pressing cake from rape, soy bean, cocoa butter, olive, sunflower, meat and bone meal, algae, residues from composing and tyres are all able to be processed by the Pyroformer, according to Prof. Bridgewater.

Installed at EBRI's new office and laboratory building – built with the help of European funds – the Pyroformer is an industrial-scale demonstration plant that provides heating, electricity and cooling for EBRI as well as other parts of the Aston campus.

Installed at EBRI's new office and laboratory building, the Pyroformer is an industrial-scale demonstration plant that provides heating, electricity and cooling for EBRI as well as other parts of the Aston campus

The Pyroformer uses intermediate pyrolysis to break down biomass into liquid, gas and char at approximately 450-500°C. Feedstock is first pelletized and dried and passes through the Pyroformer via its dual Archimedes screw system. The thermal treatment process is controlled with an externally heated jacket and chars are recycled using the outer screw.

The recycling feature makes the Pyroformer unique. Mixing recycled chars with fresh feedstock gives a larger surface area for pyrolysis and also limits the formation of tars. Up to 100 kg/h of feedstock can be processed by the Pryoformer.

Vapours produced by the Pyroformer are then passed to a series of scrubbers. The first sprays the vapour with biodiesel to remove condensibles and convert them to oil; the rest passes through an electrostatic precipitator. Both products can then be used in a 350 kW MAN dual fuel engine to produce power and heat.

Char from the Pyroformer has a variety of uses such as a soil enhancer or in carbon sequestration, and has a market value in excess of £1000/t. Char can also be used for co-firing in power stations.

In the Punjab region of India, EBRI is demonstrating how Pyroformer technology can combat the problem of open field burning while transforming the lives of rural farming communities through the generation of reliable, decentralised power. It has joined forces with the Indian Institute of Technology (IIT) to deploy a small-scale, mobile Pyroformer in three villages in Ropar district.

But as well as being versatile in its choice of feedstock, the Pyroformer can also be integrated or linked with other technologies to add value to other industrial processes. One example of this is anaerobic digestion (AD) – a natural biological process that converts organic materials into biogas, which can be used to generate power and heat, and a useful fertiliser.

There are approximately 150 AD plants in the UK, according to the Renewable Energy Association (REA). EBRI says that the water fraction produced by the Pyroformer could be recycled in AD tanks to increase the biogas yield, while digestate from the AD process could be dried for use as a feedstock for the Pyroformer.

Another possible technology integration is to use pyrolysis gases produced in the Pyroformer in a gasifier to generate clean gaseous fuels. EBRI is currently installing a 1 MWth circulating fluidised bed (FCB) gasifier at its Pyroformer demonstrator.

EBRI points out that vapour from the pyrolysis process can vary in quality, while gasifiers generally need good quality biomass fuels – which can be expensive – to operate reliably. However, putting the two together resolves both problems, providing an outlet for untreated pyrolysis vapours and improving the economics of gasifiers.

The main challenge in coupling the two technologies is the fact that the Pyroformer operates under pressure while the gasifier does not. In addition there is a considerable difference in operating temperature between the two elements – 500°C in the Pyroformer and 800-1000°C in the gasifier.

EBRI is hoping to start test runs of the integrated technologies in the next two months and eventually operate the two together to fuel the dual fuel engine.

Transforming farming communities: in the Punjab region of India, EBRI is demonstrating how Pyroformer technology can combat the problem of open field burning

Junior Isles

Energy sings the blues

The late, and most would agree great, Billie Holiday is considered one of the most influential jazz vocalists of all time. One of her most famous songs 'God bless the child' was no doubt a personal reflection of her troubles but the lyrics still ring true in many parts of life and work:

"Mama may have, Papa may have.
But God bless the child that's got
his own."

With increasing strain in relations between Europe and Russia, the words are particularly poignant – once again re-affirming the beauty of independence; in this case energy.

Russia's annexation of Crimea has put the spotlight on geopolitics and energy security. The European Commission's 2030 proposals on climate policy were expected to be centre stage at last month's European Council meeting but instead energy security was foremost in the minds of EU leaders.

Their concern is understandable. Waiting a few months to debate climate policy is not the end of the world. The implications of energy disruptions, although unlikely, or the potential for an increase in the price of Russian gas are much more pressing.

Certainly Ukraine expects Russia to increase gas prices soon. Energy and Coal Industry Minister Yuriy Prodan said he expected Russia to increase prices by at least 37 per cent this month (April). Russia had lowered its gas price to Ukraine last year. Gazprom last month said that discount would be cancelled in April. It cited Ukraine's failure to pay its debt.

Ukraine has been on the wrong end of an energy dispute with Russia in the past, which has seen the country scrambling for alternatives to Russian gas. Fortunately for its citizens, this time it is not in the dead of winter.

> ...the Crimea situation is a wake-up call for Europe... this is a tier-one issue

The gas supply cuts to Ukraine back in 2006 and 2009 certainly gave impetus to pipeline projects that offer Europe alternative routes to gas that do not go via Ukraine. If Russia cuts off gas supplies to Ukraine, Europe can still receive gas via the Nord Stream pipeline, although it transmits Russian gas. In theory gas could also be transmitted to Europe through the South Stream pipeline by December 2015. This pipeline would also carry Russian gas but with recent events it's a project that could now be dead.

Italian oil major ENI, one of the key shareholders in South Stream, is having second thoughts about the project.

Also, the Russian tycoon presented as the winner of the tender to build the Bulgarian stretch of the pipeline, appears on the US blacklist adopted in response to Russia's annexation of Crimea. US sanctions block Gennady Timchenko's assets, and should prevent his firm from carrying out any transactions on EU territory, blocking the pipeline's construction.

With both Nord Stream and South Stream serving to ultimately increase Europe's dependence on Russian gas, Europe would do better to put its faith in the Trans Adriatic Pipeline (TAP) project, which would bring gas from the Caspian Sea via Turkey.

Even so, although the TAP project will reduce dependence on Russia, Europe could be unwise to see the pipeline as its saviour. Apart from the fact that operation is not set to begin until 2019, ultimately Europe will essentially be shifting its dependence from Russia to somewhere else.

Fortunately EU leaders now recognise the urgency of Europe's precarious position. Conclusions of last month's European Council meeting call for countries to explore renewables "and other indigenous energy sources".

While every energy sector has its own agenda, this is something the wind power lobby has been stressing.

In a letter to EU foreign ministers, Thomas Becker, CEO of the European Wind Energy Association (EWEA) said that a renewable energy target of "at least 30 per cent would allow Europe to significantly scale back its fossil fuel imports, including from Russia".

According to EWEA, while the Commission's 2030 proposal for renewables would reduce gas imports by only 9 per cent, a more ambitious, yet achievable target would cut the same imports by 26 per cent, almost three times as much.

At the moment, however, the key challenge facing a higher renewables target is the much debated impact on energy costs and consequently a country's economic competitiveness. Nevertheless, few will argue that renewables offer the all important energy independence that EU governments are now clamouring for.

The same argument is also being used to provide momentum to shale gas exploration. Shale gas proponents add, however, that exploiting shale gas will deliver energy independence as well as lower cost of energy.

Reacting to the Polish government's move to streamline its shale gas licensing process and promote investment in the industry, Marcus Pepperell, spokesperson for Shale Gas Europe, said: "Shale gas could contribute to helping Poland develop a domestic, affordable and secure energy source."

Meanwhile, a recent IHS report estimates that Germany could produce enough shale gas by 2030 to cover a quarter of its current gas consumption. This, it said, would reduce energy costs and make the country more competitive.

In its recent budget, the British government announced an onshore allowance aimed at stimulating investment in the shale gas industry. Speaking at the Nuclear Security Summit in The Hague at the end of March, Prime Minister, David Cameron, commented that fracking would be "good for our country".

Cameron said that once wells are up and running later this year, there would be more public enthusiasm, and exploiting shale gas reserves could help Europe wean itself off reliance on exports from Russia. Cameron said that it was "our duty" to be more energy-independent, stressing it should be a "tier-one" political issue.

Russia certainly places a very high priority on energy independence – for itself and its newest 'member state'. Immediately after its annexation of Crimea, Russian Prime Minister Dmitry Medvedev said that Crimea's dependence on water and electricity is an infrastructural problem that needed to be addressed. He was reported as saying that Russian companies could double gas production in Crimea over the next few years in order to secure the area's energy independence from Ukraine.

Yet the likes of Greenpeace remain critical of the EU's hopes for shale gas exploitation, calling Cameron's remarks "a cynical attempt" to exploit the Ukraine crisis.

Greenpeace UK energy campaigner Lawrence Carter responded: "The argument that fracking will reduce Europe's reliance on Russian gas just doesn't stack up. The industry's own estimates show that shale gas production wouldn't reach scale for at least another decade and even then it will displace supplies of gas from Qatar, described as "secure" by the energy minister, rather than Russian imports.

"The most pragmatic and sensible way of boosting our energy security is to massively reduce the amount of energy we waste, while also investing in tried and tested clean energy technologies. These can cut our reliance on costly oil and gas imports while also creating jobs and helping to prevent catastrophic climate change."

There is some truth in Carter's statement in that this is a prime opportunity to increase energy independence, reduce imports and tackle climate change. Whether governments should pass up the chance to exploit indigenous gas resources is a point that can be debated at length.

Nevertheless, the Crimea situation is a wake-up call for Europe and Cameron is right in saying that this is a tier-one political issue. Any government that did not do everything in its power to secure its country's energy supply would be doing a disservice to the nation.

The spectre of risk will always cast a shadow over dependence of any kind, energy or otherwise. As Holiday put it:

Them that's got shall have
Them that's not shall lose
So the Bible says and it still is news
Mama may have, Papa may have
But God bless the child that's got
his own, that's got his own.