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EU takes technology neutral approach to climate change

Hinrichs-Rahlwes says the Commission "is acting in reverse-mode"

The European Commission has published its energy and climate blueprint for 2030, but not everyone is happy with the proposals, says **Junior Isles**

The EU's decision to take a more technology-neutral approach to tackling greenhouse gas emissions in its recent 2030 climate and energy framework proposal has met a mixed response from industry stakeholders.

In its long-awaited 2030 White Paper, the European Commission proposes a binding target to reduce carbon emissions by 40 per cent from 1990 levels by 2030, extending an existing goal to cut emissions by 20 per cent by 2020. Renewables will need to provide 27 per cent of EU energy by 2030, but while the target will be binding at EU level there will be no mandatory targets for member states.

The Commission also published draft legislation for structural reforms of the European Emissions Trading Scheme (ETS).

Eurelectric, the organisation representing Europe's electricity companies, welcomed the EU proposal saying it was "pleased to see that the Commission recognises the interactions between different targets and instruments."

It noted that the current 20/20/20 package has resulted in significant carbon emissions reductions, and has led to further growth, cost reductions and technological development in both renewable generation and energy efficiency. However, it also said this has resulted in a "regulatory jungle of multiple and overlapping targets and instruments", which has had negative impacts on cost-effectiveness.

Hans ten Berge, Secretary General of Eurelectric said: "We acknowledge their intention to reduce complexity and ensure greater cost-effectiveness through more European and market-driven approaches, most notably the ETS.

"Eurelectric has repeatedly called on policymakers to strengthen and extend the ETS as the most cost-effective instrument to deliver decarbonisation, including a continued and less costly expansion of renewables. We have also called for an economy-wide, binding 2030 greenhouse gas reduction target… We urge European governments to support the Commission's approach when they meet in the European Council later this year."

The proposal to let member states set their own renewable targets has angered environmental groups and renewables proponents.

Rainer Hinrichs-Rahlwes, President of the European Renewable Energy Council said: "Just five years ago, the Commission sent the signal to investors that renewable energy was to be the future for Europe. Now, the Commission is acting in reverse-mode, setting a cap for renewables, not a target for 2030."

The European Photovoltaic Industry Association (EPIA) was also disappointed with the EU framework proposal.

Frauke Thies, EPIA Policy Director said: "While the binding 2020 target for renewables proved to be a success

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World must act quickly to combat global warming

Delaying action on global warming will only increase the costs and reduce the options for dealing with the worst effects of climate change, according to a draft report by UN experts.

The final draft of the report by the Intergovernmental Panel on Climate Change says that global warming will continue to increase unless countries shift quickly to clean energy and cut emissions.

With increasing demand for energy and the growing use of coal to generate electricity, experts said emissions from the sector are projected to double or triple by 2050 from the level in 2010 unless improvements in clean energy are "significantly accelerated".

Christiana Figueres, executive secretary of the UN Framework Convention on Climate Change recently said the need for international regulation to tackle the threat of climate change is "much more compelling" now than at the failed talks in Copenhagen in 2009 because of the mounting evidence of the effects of global warming.

She also argued that conditions were now more favourable for a global deal, noting that about 30 countries or groups of countries – counting the EU as one – have climate legislation, and many more have targets.

Speaking at the 2014 Investor Summit on Climate Risk at the UN headquarters, Figueres said that the switch to greener investments is essential to tackle climate change.

"New investments must help reverse this unsustainable trend, and quickly, if the world is to have a chance of staying under a 2°C (3.6°F) temperature rise," she stressed.

According to the International Energy Agency, $36 trillion of global investment will be needed in clean energy by 2050 to meet this goal – which amounts to $1 trillion a year.

Last year, investment in renewable energy and smart technologies dropped 12 per cent to $254 billion, after falling 9 per cent in 2012 to $288.9 billion from the record $317.9 billion in 2011, according to figures released last month by Bloomberg New Energy Finance (BNEF).

Michael Liebreich, the company's founder who chairs its advisory board, told the summit the reduced investment was a result of a sharp drop in the price of solar power technology and a drop in investments in clean energy by the US and China.

In late December Solarbuzz said solar photovoltaic (PV) demand is poised for explosive growth in 2014, and is set to reach 49 GW, up from 36 GW in 2013.

Meanwhile the value of the global carbon market is set to reach €46 billion in 2014 according to BNEF. This will be up 15 per cent from last year but still well below the historical high of €98 billion in 2011.

The main driver of this year's increase will be the plan to postpone, or 'backload', auctions of European Union carbon allowances that would otherwise have taken place in 2014-16.

Guy Turner, chief economist and head of commodities at BNEF, said: "Carbon markets have been on a roller-coaster over the last few years and we continue to see a stomach-churning ride ahead."

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story, initiating massive costs reduction and technology leadership in Europe, the Commission's proposal for 2030 sadly is a lame duck,"

One senior Commission official, however, hit back saying the proposal was recognition that renewables were no longer a "small baby in the pram" but had now grown to be "a fully fledged teenager".

Allowing member states to set their own renewables targets is arguably a step back from unified EU policy. The European Wind Energy Association (EWEA) says that by effectively advocating repatriation of energy policy to member states, President Barroso appears to have forgotten his previous calls for more European integration on energy policy.

EWEA's CEO Thomas Becker commented: "The previously farsighted and ambitious European Commission is a shadow of its former self, hiding behind the UK and other backward-looking member states and lobbies."

The Commission was also accused of lopsided rhetoric, with a vision for the nuclear, CCS and shale gas industries going forward but not for renewables.

Alongside the 2030 framework proposal, the Commission published a Communication and Recommendation on the exploration and production of shale gas in the European Union (EU). This sees member states retaining the right to decide how best to implement a highlighted set of guidelines within their respective markets.

Shale Gas Europe voiced its support for the publication noting that the Commission has "sought to strike a balance between Europe's objectives of an environmentally sustainable, affordable and secure energy mix".

Marcus Pepperell, spokesperson for Shale Gas Europe said: "We are encouraged that the Commission recognises that shale gas has the potential to bridge the move away from more carbon intensive fossil fuels, delivering a secure source of domestic energy, as well as a possible source of public revenue."

The organisation stressed that shale gas could also complement the EU's objectives of moving towards a low carbon economy and promote a more affordable, resource efficient Europe.

Energy affordability has become a critical issue for Europe and is essential to restoring European competitiveness.

As promised in the conclusions of the European Council of May 22, 2013, the European Commission also published a paper on energy prices and costs. The study recognises that the various components of energy prices have developed differently: most notably the energy component has remained stable, while levies and taxes have risen, thereby increasing end-user prices.

Eurelectric said it was "highly disappointed" that the study does not clearly set out where and how customers are paying over the odds for their electricity.

"It makes it impossible to tell how different policies have affected prices. Which policy decisions – on support schemes, generation mix, tax exemptions, etc. – have which cost impact? The report again does not provide any satisfactory answers," it stated.

The Commission's White Paper will be discussed at the March and June Councils by European Heads of States.

Global energy demand growth slowing

A new extended energy outlook from BP says that energy demand is slowing, but predicts that global carbon dioxide emissions will rise by 29 per cent.

Junior Isles

Global energy demand continues to grow but at a slower rate, according to the BP *Energy Outlook 2035*.

In this fourth annual edition of the *Outlook*, it is the first time that BP sets out its view of the most likely developments in global energy markets beyond 2030 to 2035, based on up-to-date analysis.

"By pushing the horizon out to 2035 we're seeing some really interesting new angles on where energy demand is going," commented Bob Dudley, BP Group Chief Executive.

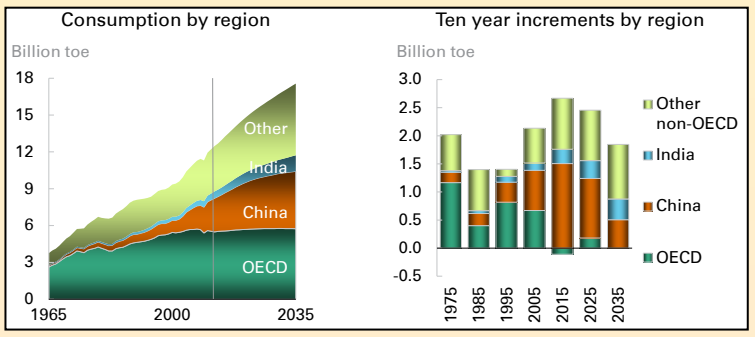
According to the *Outlook*, global energy consumption is expected to rise by 41 per cent from 2012 to 2035 – compared to 52 per cent over the last 20 years and 30 per cent over the last ten. Most of that growth in demand, 95 per cent, is expected to come from emerging economies – China and India particularly.

Shares of the major fossil fuels are converging with oil, natural gas and coal each expected to make up around 27 per cent of the total mix by 2035 and the remaining share coming from nuclear, hydroelectricity and renewables. Gas is the fastest growing fossil fuel – with demand rising at an average of 1.9 per cent a year – increasingly being used as a cleaner alternative to coal for power generation.

Shale gas supplies are expected to meet 46 per cent of the growth in gas demand and account for 21 per cent of world gas and 68 per cent of US gas production by 2035.

Renewables are expected to continue to be the fastest growing class of energy, gaining market share from a small base as they rise at an average of 6.4 per cent a year to 2035. Renewables' share of global electricity production is expected to grow from 5 per cent to 14 per cent by 2035.

While the OECD economies have led in renewables growth, renewables in the non-OECD are catching up and are expected to account for 45 per cent of the total by 2035.



Dudley commented that the *Outlook* "highlights the power of competition and market forces in unlocking technology and innovation to meet the world's energy needs."

The *Outlook* also predicts that global carbon dioxide emissions will rise by 29 per cent, with all of the growth coming from the emerging economies. However, it also notes some positive signs: emissions growth is expected to slow as natural gas and renewables gain market share from coal and oil; and emissions are expected to decline in Europe and the US.

Notably, towards the end of the period covered by the *Outlook* BP says it expects many advanced countries will see their economies grow while their energy use falls.

BP Chief Economist Christof Rühl said: "… people are finding ways to use energy more efficiently because it saves them money. This is also good for the environment – the less energy we use the less carbon we emit."

Panel moves to block EPA mandatory CCS rule

- CCS has to prove commercial availability
- Alabama plant completes demo phase

A vote by the US House Energy and Power Subcommittee to approve the Electricity and Affordability Act will effectively prevent the Environmental Protection Agency (EPA) from mandating the use of carbon capture and sequestration (CCS) technology to reduce CO_2 emissions from new coal-fired power plants. According to the Act, coal plants will not be required to implement CCS until the technology has been shown to be commercially available and demonstrated at commercially operated coal-fired power plants. The subcommittee approved the bill by a vote of 18-11.

The bill would apply to any rules EPA issues creating New Source Performance Standards for greenhouse gas emissions from new and existing fossil fuel-fired power plants under Section 111 of the Clean Air Act.

"We are simply saying we will set some parameters," for regulation of coal-fired power plants, said Subcommittee Chairman Ed Whitfield, R-Ky., who introduced the bill.

The legislation would require carbon dioxide-reducing technologies such as CCS to be commercially demonstrated at six different sites for at least a year.

The industry moved closer to that goal last month when a project, conducted jointly by Mitsubishi Heavy Industries, Ltd. (MHI) and Southern Company Services, Inc. (SCS), completed an initial demonstration phase.

The demonstration test is an integral part of a project focused on achieving recovery of CO_2 from coal-fired power plant emissions on a globally unprecedented scale of 500 metric tons per day (mtpd). To conduct the test, a demonstration plant for separating and recovering CO_2 was constructed on the premises of an SCS affiliate's coal-fired power plant in Alabama.

Also in January the US Department of Energy gave the long-planned FutureGen clean-coal project one of the final OKs it needs to start building.

In the document, known as a record of decision, the DOE said the project planners had addressed EPA concerns about potential air pollution and other matters. The department is providing $1 billion to the project, with the rest of the money coming from the FutureGen Alliance, a group of coal companies that have come together to work on the project.

The project would see the refit of a coal-fired power plant in Meredosia in western Illinois to remove carbon dioxide from the plant and store it underground.

FutureGen was first proposed in 2003 by the Bush administration. Initially, it would have involved building a new power plant in Mattoon in eastern Illinois.

Russia moves to strengthen European presence

Russia's move to finance two Russian-built reactors at Paks, Hungary's only nuclear power plant, will not only aid Russia's advance into the European nuclear market but could also help it use energy to exert influence over eastern Europe.

With the existing Russian reactors reaching the end of their life from 2032, Rosatom said Russia was ready to lend €10 billion to cover much of the new reactors' construction cost.

Under the deal, Rosatom will build two blocks with a 1200 MW capacity each. This will more than double the capacity of the Hungarian nuclear plant, which currently has four Russian VVER-type reactors with a combined capacity of about 2000 MW. The first new block could become operational in 2023.

According to János Lázár, Hungary's minister of state, the EU has already informed the government that it had no objections to the bilateral agreement between Hungary and Russia on the nuclear upgrade.

The EU has been working to reduce central and eastern Europe's reliance on Russian energy.

Paks supplies about 40 per cent of Hungary's electricity and the deal means Russia will continue to provide the bulk of the country's energy needs for years to come. Russia already accounts for about three-quarters of the country's oil and gas needs.

Hungary's opposition criticised the failure to hold a tender, saying that the deal was not transparent.

Bernadett Szél, co-president of the green LMP party in Hungary's parliament, said: "There has been absolutely no social, professional or political debate in Hungary about the enlargement of Paks… this will tie Hungary to Russia for the next century, since the costs are extremely high."

EIA data shows coal's decline

- Brief coal revival drives increase in emissions
- Energy efficiency improves in residential sector

Carbon dioxide emissions rose in the USA in 2013, reflecting a small increase in coal consumption in the electric power sector.

The US Energy Information Administration (EIA) reports that CO_2 emissions rose in 2013 by approximately 2 per cent over 2012 levels, but says that emission levels are expected to fall in 2014 and 2015.

It also says that coal's use will decline in the coming years as natural gas takes over as the largest fuel source for the country's power generation sector by 2040.

The EIA said that in April 2013 the use of coal hit an all-time low but then regained some market share. However, it noted that the overall impact on the country's CO_2 emissions trend was small and that CO_2 emissions are around 10 per cent below 2005 levels.

In its outlook for 2014, EIA says that coal production in the USA is expected to increase by almost four per cent as higher natural gas prices make coal more competitive for power generation. The share of US electricity generated by coal is expected to increase from 39.1 per cent last year to 40.2 per cent this year.

However, coal's share of generation falls to 38.6 per cent in 2015 as more US coal-fired power plants are retired, says the EIA. In the long term, it predicts that low natural gas prices will make the fuel the most economic proposition for new generating capacity, boosting its share in electricity generation to 35 per cent by 2040, with coal losing out and declining to 32 per cent by the same year.

In some regions, natural gas would also replace nuclear capacity, EIA said in its long term outlook.

Just last year, the EIA had projected coal to maintain its dominance over natural gas, with 35 per cent of generation in 2040, compared to 30 per cent for natural gas.

Renewable power is forecast to increase its share of generation from 12 per cent in 2012 to about 16 per cent in 2040, according to the new EIA figures.

"Generation from renewable resources grows in response to federal tax credits, state-level policies, and federal requirements to use more biomass-based transportation fuels, some of which can produce electricity as a byproduct of their production processes," the EIA said. "In their final decade of projection, however, renewable generation growth is driven by increasing cost competitiveness with other non-renewable technologies."

EIA also says that improvements in energy efficiency have helped to slow the growth in residential electricity use in recent years, and further declines in consumption are projected for 2014 and 2015.

The improving US economy will boost electricity consumption in the industrial sector in 2014 and 2015, the EIA said.

Energy firms seek Mexican opportunities

- Enel seals cooperation agreement
- Iberdrola wins bid for CCGT

Siân Crampsie

Mexico's move to reform its energy sector is already attracting the attention of power sector investors.

At the end of 2013 the country passed landmark legislation to open up its oil, gas and power sectors to private investors and last month Enel, Mitsui and Iberdrola all signed deals to invest in the power sector.

Enel signed a memorandum of understanding with the Mexican Instituto de Investigaciones Eléctricas to cooperate on geothermal generation and smart grids, two areas that Mexico is keen to expand.

Meanwhile Mitsui purchased a 50 per cent stake in a 160 MW wind farm in Oaxaca state, and Iberdrola won a contract to build a 300 MW combined cycle power plant in Baja California.

Under their deal, Enel and Instituto de Investigaciones Eléctricas will share information and know-how on smart grids and geothermal technology via pilot projects, training programmes and technology transfers.

The Mexican government wants to implement smart grids to boost efficiency and to increase the proportion of renewables in the country's power generation mix.

The energy reform is designed to attract investment into Mexico's energy and power sectors in order to support economic growth, and the government says it will lead to a cut in the country's high electricity prices.

While investor focus has been on the vast opportunities in Mexico's hydrocarbons sector, experts say the opening up of the electricity sector will have a swifter impact.

Iberdrola says that it will invest $270 million in the construction of the Baja California III power plant. It will sell the energy produced from the plant to the Mexican Federal Electricity Commission (CFE) for 25 years.

Construction is due to start in April 2014 and commercial operation is scheduled for August 2016.

Mitsui has purchased a stake in the 160 MW Santo Domingo wind project, which is being developed by EDF EN and which is due to start operating in April 2014.

The deal follows Mitsui's acquisition in February 2013 of 50 per cent of the Bii Stinu (164 MW) wind project, located in the same area of Oaxaca.

CA regulators propose tariff changes

Electricity consumers in California could soon be paying different rates for energy depending on the time of day it is used if regulations proposed by the state's regulators come into effect.

The California Public Utilities Commission (CPUC) wants to implement time-of-use tariffs for residential users in order to reduce electricity demand at peak times.

The proposed regulations would take California's pioneering demand response (DR) programmes a step further, and could help utilities to delay investments in new generating capacity.

CPUC presented its proposals in January, as the grid in many states in northern and eastern USA came under strain amid an extreme cold snap.

Appalachian Power said that its customers in Virginia, West Virginia and Tennessee set an unofficial all-time high peak demand during the freeze, while TVA also reported electricity consumption across its service area reached a new high. PJM said similar records were set on its grid and called for consumers to cut electricity use.

California experiences peak during the hot summer months and has been a leading proponent of DR programmes in which consumers voluntarily pledge to cut electricity use in peak periods – usually in return for financial gain or the prospect of reduced energy bills.

The CPUC's proposed changes would also help to restore balance to electricity tariffs in the state, which were partially frozen in the wake of the 2000-2001 energy crisis. Consumers whose rates were not frozen have been carrying the burden of cost increases while others no longer pay enough to cover the costs of producing and distributing energy, says CPUC.

Abengoa to build LatAm's first CSP

The construction of a solar tower plant equipped with a pioneering thermal energy storage system in Chile could act as a catalyst for the development of further solar thermal power plants in Latin America, say the project's developers.

Abengoa has been awarded a contract by Chile's Ministry of Energy and Corporacion de Fomento de la Produccion (Corfo) to build the 110 MW plant and says that the project will demonstrate the "huge potential" for solar thermal technology in Chile.

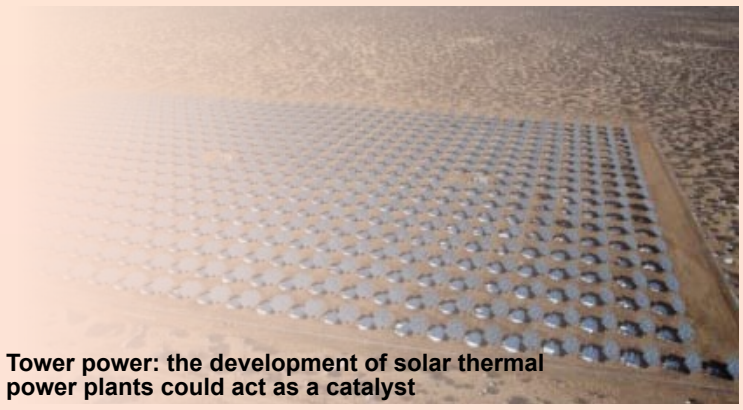
The project will be located in the Atacama Desert, which has some of the highest solar radiation concentrations in the world.

The molten salt storage technology will enable the plant to produce electricity for up to 17.5 hours when radiation levels are low.

The storage technology will make the plant very manageable and flexible, and enable it to supply electricity in a stable way, 24 hours a day, responding to all periods of electricity demand. The plant will be the first solar thermal plant for direct electricity production in South America.

The new project will be located in the commune of Maria Elena in the Antofagasta region, northern Chile. The project forms part of Chile's national renewable energy programme, intended to provide Chile with clean energy while also promoting economic development and reducing dependency on coal and natural gas.

Chile has set a target to produce 20 per cent of its electricity from clean energy sources by 2025.



Tower power: the development of solar thermal power plants could act as a catalyst

Power sector threatens Philippines' economy

Philippine government officials are gathering proposals on how to address a potential power crisis as its 2014 economic growth target comes under threat. **Syed Ali**

The ongoing power crisis in the Philippines is threatening the country's economic growth target for 2014.

Economic Planning Secretary Arsenio Balisacan recently acknowledged that the power situation has become a key concern, pointing out that the government's 2014 economic growth target of 6.5 to 7.5 per cent did not take into account the potential effects of problems related to the country's power supply.

"Obviously, the power problem will have an implication on inflation and growth of the economy [if left unresolved]," Balisacan said.

He said concerned officials were gathering proposals on how to address a potential power crisis, adding that President Aquino himself raised the importance of the matter during a recent meeting with his economic team.

"We cannot say at this point what actions would be taken, but we are studying the issue very closely," Balisacan added.

There is a proposal in the legisla -ture to give President Aquino emergency powers to address the problem immediately.

Although the country recently announced the start of construction on some key projects, it will be some time before they start operation.

Last month, President Aquino led the groundbreaking ceremony for First Gen Corp.'s third natural gas fired power plant in Batangas City. First Gen targets to start commercial operations of the San Gabriel plant's first three generating units by the second quarter of 2016.

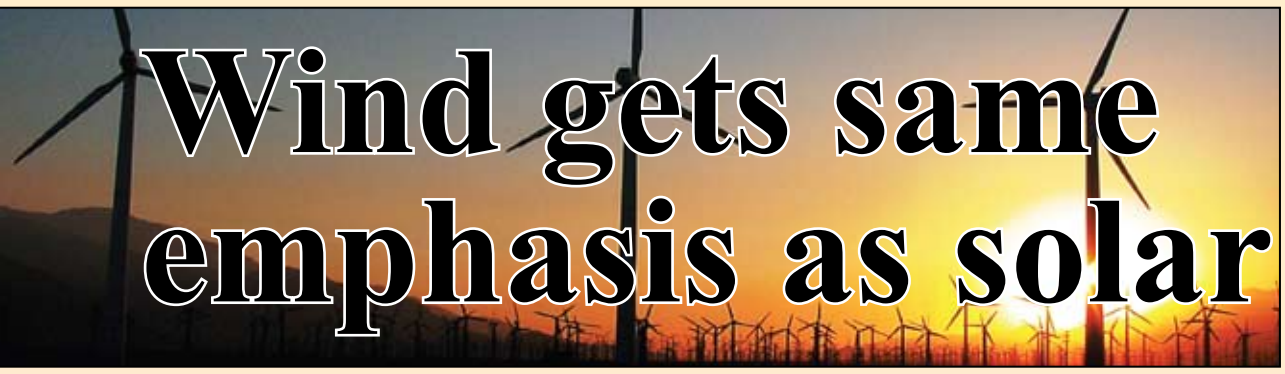
AES Masinloc Power Partners Co., Inc. also said last month it is now consulting international and local banks to fund its 600 MW coal fired project. Construction is expected to start shortly with target commissioning of the plant in the third quarter of 2017.

In the meantime the country's economic woes look set to be compounded by a court decision in late December that temporarily rules out an electricity price rise. The Manila Electric Co. (Meralco) warned of rotational blackouts if it can no longer pay for generation and transmission charges as a result of the Supreme Court's temporary restraining order (TRO).

"With the TRO in place, it will not be far-fetched to imagine that some (generation companies) might altogether refuse to sell electricity to Meralco, or decide to sell to Meralco only an amount of electricity as is commensurate to the resulting rate of P5.6673 ($0.125) per kilowatt-hour," Meralco said in a statement to the court.

It further warned: "The transmission company may stop transmitting if Meralco was unable to pay for the transmission charges. The entire power industry may come to a screeching halt."

It said the rotational brownouts would have "dire consequences" on the economy and security.



Wind gets same emphasis as solar

India's planned launch of the National Wind Energy Mission (NWEM) in the middle of this year will put wind on the same footing as solar. However, unlike the country's flagship National Solar Mission, the NWEM will not involve projects for bidding. It would serve as a "facilitator" for increased wind generation, officials said.

India has had grid connected wind based power for nearly 20 years. It is the fifth largest wind power producer in the world with an installed capacity of 19 GW. However, capacity additions fell to a decade-low during the last and current fiscal year as a result of policy problems.

The industry, especially the private sector, has complained about the lack of proper grid infrastructure for evacuation of wind power. This has led to delays in payments by the states to the power developers.

Alok Srivastava, joint secretary (wind) in the ministry for new and renewable sources of energy (MNRE) said: "We wish to coordinate separate lines of action in the wind sector and involve all the stakeholders. Wind energy led to the establishment of renewable based power in the country but lately it has been marred by several issues."

Under its proposed action plan, MNRE would strengthen grid infrastructure for wind power, identify high wind power potential zones, ease land clearances for the projects, regulate wind power tariff and incentivise investment in the wind sector.

MNRE plans to extend the 'generation based incentive (GBI)' for project developers for five years. Under this financial scheme, government would pay wind power developers Rs5 ($0.08) for every unit of power generated from the wind facility.

Through this mission, government aims to have a generating capacity of 100 GW of wind power by 2022. The potential of wind-based power in the country is estimated at 300 GW.

"The proposed NWEM would be placed in the cabinet soon and we wish to kick start it in the next 6 months," said Srivastava. He also said that all stakeholders in the wind sector, ministry of power, Powergrid Corporation, central and state electricity regulators, planning commission, private and public sector project developers would be a part of the mission, with the MNRE acting as a key facilitator and moderator.

■ At the end of December, the Southern Grid was synchronously connected to the rest of the country's grid. This marked the successful completion of the mission of 'One Nation – One Grid – One Frequency'.

Vietnam postpones nuclear plans despite increasing demand

Vietnam will delay the construction of its first nuclear power plant by six years despite being faced with increased demand for power and a need to develop new energy sources.

The country had awarded the construction contract for its first 2000 MW nuclear power plant to Russian companies. The second 2000 MW project was awarded to companies from Japan. Construction of the first plant in Ninh Thuan province was originally slated to start this year.

However, *Tuoi Tre* newspaper quoted Prime Minister Nguyen Tan Dung as saying that construction will probably have to be postponed until 2020 to ensure the highest safety and efficiency standards.

Vietnam has outlined plans to build seven nuclear power plants by 2030 but there have been fears over nuclear power technology following the 2011 Fukushima disaster in Japan.

Meanwhile, the Asian Development Bank has said the country's domestic electricity demand may rise by up to 14 per cent per year until 2015 and plateau at 11 per cent growth until 2020.

Last month Electricity of Vietnam's National Power Transmission Corporation (EVNNPT) set a target of generating between 122-122.5 TWh of electricity in 2014, up 9-9.5 per cent from last year.

■ Vietnam's first 622 MW turbine of the Vinh Tan 2 thermal power plant in the central province of Binh Thuan, joined the national grid as scheduled on January 15th, after a three-year construction period.

Nuclear could help revive Pakistan

- China agrees $6.5 billion loan
- Plans for 8900 MW by 2030

Syed Ali

China's decision to provide Pakistan with a multi-billion dollar loan for construction of two nuclear power plants in Karachi could help revive Pakistan's ailing economy, create jobs and mitigate social unrest.

With its economy at a critical growth stage, the Pakistani government views nuclear energy development as a favourable long-term power generation option. Pakistan has long been plagued by a severe power shortage that has caused prolonged load shedding, resulting in social unrest.

In December China agreed to provide Pakistan with a $6.5 billion loan to construct twin nuclear power stations in the southern port city of Karachi, the largest-ever Chinese financing deal for a single project in the country.

Pakistan has an electricity demand of about 16 500 MW, while installed capacity is only 12 000 to 13 000 MW. The Karachi facilities will add 15 per cent to the nation's generation capacity. Pakistan's Prime Minister Nawaz Sharif hailed the project as "a big source of electricity supply".

While construction of the two power plants – known as the K-2 and K-3 – is already underway, Pakistani officials revealed for the first time in December that loans for the project would be provided by state-owned China Exim Bank, in a deal that would be repaid over the next 20 years.

Shahidur Rehman, an expert on Pakistan's nuclear development, said China's growing commitment to nuclear projects in Pakistan was also driven by a commercial strategy to attract new customers for its nuclear technology.

"Pakistan is the first country outside China where the Chinese are building nuclear plants. If they can showcase a success story in Pakistan, I am sure there will be other potential customers," Mr Rehman said.

Pakistan plans to have seven functional nuclear plants of 1100 MW each by 2030 in addition to four units of 300 MW, producing a total of 8900 MW of electricity.

Total's investment boost UK shale gas sector

Total's $1.6 million bet on the UK's shale gas sector is described as a turning point for the industry, writes **Siân Crampsie**.

International energy companies are likely to follow the lead taken by Total in investing in the UK's shale gas sector, say analysts.

The French oil giant has acquired a 40 per cent interest in two shale gas exploration licences in the UK, a move hailed as a key milestone in the country's efforts to turn the nascent shale gas sector into a big industry.

Total will pay $1.6 million for the two stakes in the Gainsborough Trough, a geological basin in eastern England thought to be rich in shale gas reserves.

The move was widely welcomed by the oil and gas industry and by the UK government, which has also revealed new policies designed to encourage local councils to support fracking – the method used by oil firms to extract shale gas from deep underground.

Total's deal follows a similar investment made by Centrica last year in a shale gas exploration licence in northwest England owned by Cuadrilla, and another by GDF Suez in licences held by Dart Energy. Further investments are expected, say analysts.

"We anticipate more oil and gas majors will look to strike similar deals with UK shale gas players," said Angus McPhail, analyst at Edison Investment Research. "These farm-in deals provide explorers with the much needed finance and often operational expertise required to prove up conceptual shale developments."

The bans on fracking and slow pace of development in other European countries means that investors are turning to the UK, where the government has made clear its desire for a shale gas industry to develop.

Countries including France have banned fracking, and last month Poland's plans to develop its shale gas resources were dealt a blow when Italian firm Eni said it would be pulling out of exploration licences there because of unfavourable geology. ExxonMobil, Marathon Oil and Talisman Energy have already exited Poland.

The UK last year outlined a regulatory roadmap for UK shale oil and gas developers and introduced the most competitive tax regime in Europe for shale gas. Recent estimates put shale gas reserves at 1300 trillion cubic feet in the Bowland shale – which covers 11 counties in northern and central England – alone. The government believes that shale gas exploration would trigger investments of £3.7 billion per year and create over 70 000 jobs.

It also believes that the gas would help to improve security of supply and help to plug a gap in the power generation sector left by the retirement of ageing capacity.

It's recent announcement that local councils would be able to keep 100 per cent of the business rates they collect from shale gas operations – double the current 50 per cent rate – is also seen as a shot in the arm for the industry.

Marcus Pepperell of industry group Shale Gas Europe said that the government's proposals showed that it was "important to foster engagement and cooperation" at community level.

Nicola Walker, CBI Director for Business Environment, said: "Shale gas has a vital role to play in diversifying our energy mix and the government is right to make investment more attractive.

"Shale gas exploration will help keep the lights on while bringing much-needed jobs to local communities, but it will not be the silver bullet that solves all our energy needs."

But others in the industry say that the UK government should do more to help the development of a shale gas supply chain. "UK shale gas will not be commercially viable unless the necessary expertise and plant is available at a reasonable cost and the government should consider how to help accelerate the growth of the shale gas industry by organising some soft funding schemes, a kind of funding for lending, but focused on shale," said Glynn Williams, partner at Epi-V, the oil and gas services investor. "This will help ensure the industry is well financed to take advantage of the latest technologies, be as environmentally conscious as possible and that sufficient skilled technicians are trained and retained."

Court cases question German pathway

RWE is planning to pursue a claim for compensation after one of Germany's highest courts ruled that the government's decision to force the closure of a nuclear power plant in 2011 was unlawful.

The Federal Administrative Court ruled in January that the German state of Hesse had not carried out enough consultation when it ordered the three-month closure of the Biblis plant – Germany's oldest nuclear reactor.

The German utility, whose balance sheet has been pressurised by a combination of low energy prices, increasing levels of renewable generating capacity and Germany's pledge to abandon nuclear power, says it will now pursue a civil compensation claim, but has not indicated the extent of the claim.

Germany imposed an immediate three-month moratorium on the country's seven oldest nuclear plants after Fukushima and then ordered their permanent closure when it decided to phase out nuclear power altogether in the country.

The decision has hit the country's nuclear operators hard and the financial effects have been compounded by low energy demand and the increased amount of subsidised renewable energy on the grid. Numerous coal and gas-fired power plants have been idled or closed across Europe.

In January EnBW filed a legal complaint after it was denied permission to close four coal-fired plants.

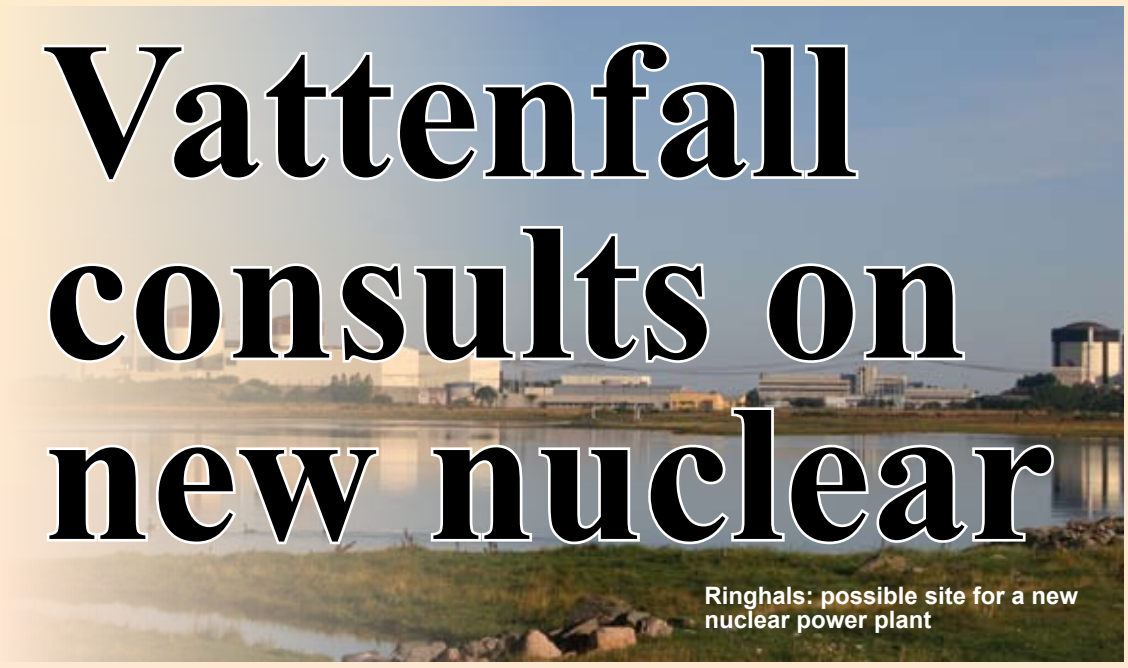
The German regulator says that EnBW has to keep the unprofitable plants open in order to ensure security of supply.

EnBW's predicament indicates the extent of the challenge that Germany faces implementing its transition away from nuclear energy to clean energy – although renewable energy capacity has risen over the last decade, there is not enough to cover the closure of nuclear capacity and fossil fuels are needed to plug the gap.

Data from Germany shows that electricity production from brown coal rose to its highest level last year since 1990. As a result, Germany's carbon dioxide emissions, which rose from 917 million tonnes in 2011 to 931 million tonnes in 2012, are estimated to have increased by a further 20 million tonnes in 2013.

GDF Suez says that over the last six years around 50 000 MW of gas-fired capacity in Europe has been closed or mothballed by ten of the region's largest utilities.

Vattenfall consults on new nuclear



Ringhals: possible site for a new nuclear power plant

Vattenfall is investigating the possibility of building a new nuclear reactor at the Ringhals power plant on the southwest coast of Sweden.

The Swedish state-owned utility is to begin consultations with authorities and residents about a new reactor. The move follows an application submitted by Vattenfall to build new reactors in 2012 after the government said in 2009 that utilities could replace old reactors with new capacity.

Sweden has ten nuclear reactors, four of which are at Ringhals. Vattenfall is expecting to decommission the two oldest units at Ringhals in 2025 and 2026.

■ EDF and GDF Suez will invest €600 million to extend the life of the Tihange nuclear power plant in Belgium, according to a report in *Les Echos* newspaper last month. The two firms will sign an agreement with the Belgian government to extend the plant's life by ten years, with the government taking 70 per cent of the profits, according to the newspaper.

Wind power tops Spanish generation

Wind power was the largest single source of electricity in Spain in 2013, according to the country's grid operator.

Red Eléctrica de España (REE) has released a preliminary report on the country's power system, revealing that for "the first time ever [wind power] contributed most to the annual electricity demand coverage".

The data shows that wind met 21.1 per cent of electricity demand on mainland Spain in 2013, marginally above nuclear energy, with 21.0 per cent.

In total, wind farms are estimated to have generated 53 926 GWh of electricity, up 12 per cent on 2012, while high levels of rainfall meant hydroelectric power output was 16 per cent higher than the historical average, climbing to 32 205 GWh.

Iran agrees to nuclear pledges

■ Six-month deal on sanctions ■ IAEA granted access to nuclear sites

Siân Crampsie

Iran will halt uranium enrichment above five per cent and begin down-blending its uranium stockpiles after reaching agreement with EU negotiators on the technical details of a nuclear deal signed last year.

In November 2013 Iran reached an agreement with the so-called P5+1 countries to limit its nuclear programme in return for the easing of some economic sanctions. In further meetings in Geneva last month, a set of technical understandings on the measures to be undertaken by both sides was worked out.

The agreement is seen as a major step forward in bringing Iran closer to the international nuclear community and halting allged development of nuclear weapons.

The deal was welcomed by US secretary of state John Kerry, who said: "While implementation is an important step, the next phase poses a far greater challenge: negotiating a comprehensive agreement that resolves outstanding concerns about the peaceful nature of Iran's nuclear programme."

Under the agreement, Iran will not enrich uranium to over 5 per cent U-235, nor make any further advances of activities at its Natanz and Fordow enrichment plants or the Arak heavy water reactor. It will not install any further centrifuges, and will dilute half of its working stock of 20 per cent-enriched uranium to no more than 5 per cent.

Iran will also give the International Atomic Energy Agency (IAEA) daily access at nuclear facilities at Natanz and Fordow as well as access to centrifuges, and uranium mines and mills.

In return, Iran will receive targeted sanctions-relief worth $7 billion. Other restrictive sanctions will remain in force.

The initial terms of the agreement run for six months, after which the concessions will expire unless a final comprehensive settlement has been agreed with Iran on the reversal of its nuclear enrichment programme in return for sanctions relief. If a final agreement is not reached, the P5+1 nations – China, France, Germany, Russia, the UK, the USA and the EU – have pledged to increase the sanctions pressure again.

Palestinian firm signs Israeli gas deal

A power plant planned for construction in the West bank will use natural gas from an Israeli gas field, its developer has said.

Palestine Power Generation Co. has signed an agreement with Texas-based Noble Energy Inc. and its Israeli partners for the supply of gas for 20 years to a new plant it is building near the city of Jenin.

Palestine Power Generation will pay $1.2 billion for around 4.75 billion cubic metres of gas from Israel's newly discovered Leviathan gas and oil field.

The Leviathan field, located about 80 miles west of Haifa in northern Israel, is scheduled to start production in 2017.

In June last year, Israel's Cabinet approved the export of about 40 per cent of the country's recently discovered reserves of natural gas while keeping a 25-year supply for national consumption.

Several large natural gas fields have been discovered in the Mediterranean Sea off the coast of Israel in recent years and they are thought to hold approximately 950 billion cubic meters of gas.

Last month the Tamar natural gas field partners signed a $200 million gas supply contract with GP Global power Ltd., which is planning to build a 120 MW power plant in Israel.

Turkey gears up for nuclear construction

Turkey is working to establish its nuclear supply chain in preparation for the construction of two new nuclear power plants.

Istanbul Technical University (ITU) has signed a memorandum of understanding (MOU) with Rolls-Royce to support the two nuclear power plant projects – planned for Akkuyu and Sinop.

Meanwhile Mitsubishi Heavy Industries (MHI), which is to lead development of the Sinop plant, says that it will establish a new business unit to take the project forward.

ITU and Rolls-Royce are planning to jointly assess the capability and development needs of the Turkish supply chain. Turkey's Minister of Energy and Natural Resources Taner Yildiz said that the agreement formed an important milestone in the development of a domestic nuclear power industry in the country.

"This collaboration will showcase our local capabilities regarding nuclear power plant projects," said Yildiz. "ITU's technology park will be hosting the Turkish companies taking part in these huge projects."

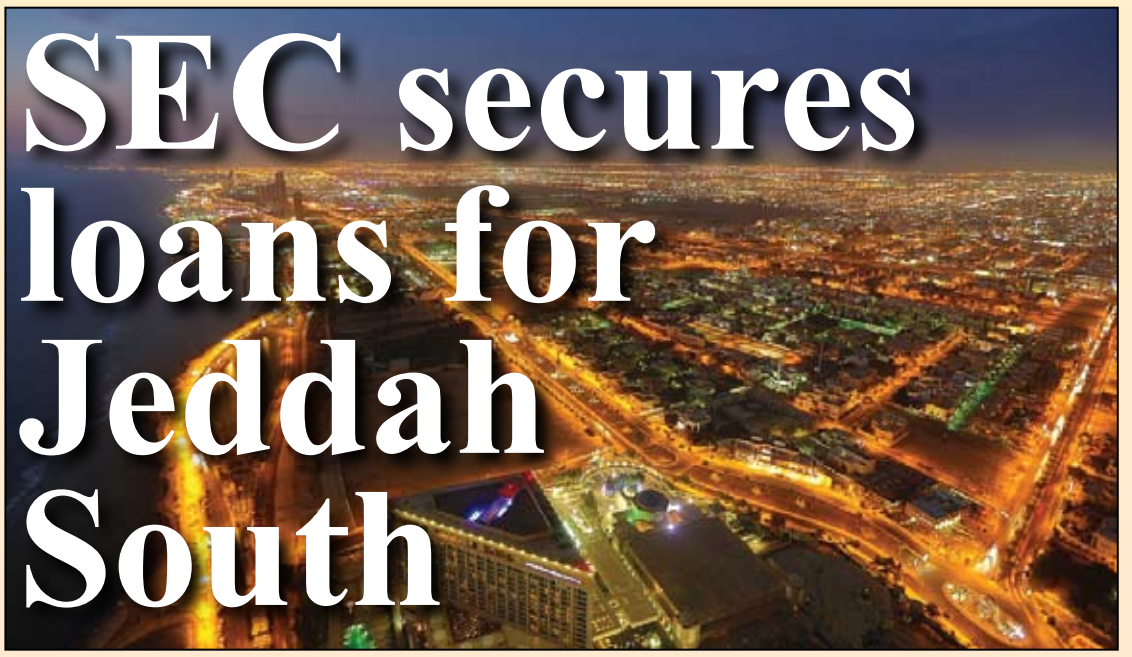
Turkey aims to maximise the use of locally sourced parts and equipment in the two nuclear power plants. The $22 billion Sinop project is expected to receive parliamentary approval in June, according to local reports.

The Sinop project will involve the construction of four nuclear reactors based on Atmea-1 technology designed by an MHI-Areva joint venture.

Last year Japan and Turkey signed a governmental agreement for the cons-truction of the plant. MHI says that its new business unit will now take on the role of accelerating the detailed contract negotiation phase.

The $20 billion Akkuyu project will be built by a Russian consortium led by Rosatom. The plant will consist of four 1200 MWe AES-2006 units.

Istanbul Technical University (ITU)



SEC secures loans for Jeddah South

Syed Ali

Saudi Electricity Company (SEC) has secured commercial loans worth SR7.5 billion ($2 billion) for the construction of a new 2650 MW power plant south of Jeddah.

SEC CEO Ali bin Saleh Al-Barrak said agreements have been signed with Bank of Tokyo-Mitsubishi, Export-Import Bank of Korea, Mizuho Bank, Sumitomo Bank, HSBC Bank, Deutsche Bank and Apex Deutsche Bank.

South Korean group Hyundai Heavy Industries is building the new oil-fired power plant, while Mitsubishi Heavy Industries will supply equipment for the plant, which is expected to be completed in 2016.

Jeddah South is just one of the power plants currently being developed by SEC, with the monopoly utility spending billions of dollars to increase generation capacity in a country where demand is growing by around nine per cent per annum.

Last month, a consortium led by ACWA Power signed a power purchase agreement with SEC to finance, build and operate the 2060 MW Rabigh 2 power plant on the west coast of the Kingdom – a project due to cost around $1.36 billion.

Al-Barrak also said SEC planned to raise capacity at its Qassim oil-fired plant by around 360 MW over the next three years, having only recently upgraded it to produce 1700 MW.

In December Siemens was awarded a SR660 million contract to build a 380 kV substation in the Hail region, which is seeing rapid population, agricultural and industrial growth.

Also in December EDF and Areva signed agreements with five Saudi industrial partners aimed at boosting workforce skills and building an extended network of Saudi suppliers for future nuclear projects in the country.

A second series of agreements with four Saudi universities (King Saud University in Riyadh, Dar Al Hekma College and Effat University in Jeddah and Prince Mohammed bin Fahd University in Al-Khobar), are intended to contribute to the development of nuclear expertise in the country.

EDF CEO Henri Proglio commented: "These new agreements underline EDF and Areva's commitment alongside the Kingdom of Saudi Arabia to enable it to successfully implement its national energy strategy and in particular to develop its future nuclear programme by contributing to the development of a local network of manufacturers and by training qualified engineers."

RAECO ramps up diesel capacity

Oman's Rural Areas Electricity Company (RAECO) is planning to increase investment in new diesel-based power generation capacity to meet escalating electricity demand in areas that fall outside the country's two principal electricity grids.

In Musandam Governorate, the state-owned utility is developing its biggest-ever diesel-based power plant at Khasab. At 80 MW, it will surpass in size its 63 MW diesel-fired power station in Duqm, which currently ranks among the largest of its network of 45 electricity plants operating within its jurisdiction.

More than half a dozen local power engineering contractors are bidding for RAECO's contract to execute the 80 MW project at Khasab on an EPC basis.

Technical bids were opened recently and their evaluation is under way, according to RAECO officials. This will be followed by the evaluation of the corresponding financial offers. A two-year timeframe has been specified for the execution of the project upon the announcement of a contract award.

Gamesa and Areva pool offshore resources

Gamesa and Areva want to accelerate large-scale turbine development and take advantage of opportunities in Europe's offshore sector.

Siân Crampsie

Gamesa and Areva say their proposed joint venture in the offshore wind sector will help them accelerate technology development and create a leading global player in the industry.

The two companies have started negotiating the creation of the venture, which would have a 50-50 ownership and pool their offshore personnel and wind-related technologies and assets.

The move will help the two companies – which have limited offshore wind sector experience relative to other turbine manufacturers – to gain a greater foothold in the European offshore sector, where the installed offshore base should reach 25 GW by 2020.

The companies say that they will also target Asia, another emerging offshore wind market. They will be competing against firms such as Siemens, Bard and REpower, which have so far dominated Europe's offshore sector.

Gamesa in particular is in the early stages of its offshore career. The Spanish firm – a key player in the global onshore wind energy sector – has installed a prototype 5 MW offshore wind turbine at Arinaga Quay in the Canary Islands and says that its medium- to long-term plan is to develop a 7-8 MW offshore model.

Gamesa will contribute its existing multi-megawatt technologies, which are applicable to the offshore sector to the joint venture, including the 5 MW technology and its offshore-related engineering, operation and maintenance capabilities. Areva will contribute its German turbine assembly and blade manufacturing plants to the deal, as well as its offshore wind technology and commercial contracts.

"This agreement with Areva allows Gamesa to position itself as a market leader in the offshore wind industry. The JV will provide Gamesa with an additional profitable growth platform complementary with its 2013-2015 Business Plan and which shall create material synergies with our onshore wind activities," said Ignacio Martin, Chairman of Gamesa. "Likewise, this joint venture will pave the way for the creation of a leading and cutting-edge company in the offshore segment with know-how across the end-to-end wind energy value chain."

Areva is currently installing 120 of its M5000 5 MW offshore wind turbine units at two projects in the North Sea. It has a further six M5000 units in operation at the Alpha Ventus offshore wind project.

The French firm is also developing the M8000, an 8 MW unit, which it has offered to its partners as part of bids to build offshore wind farms in France. A spokesman said that development of the M8000 would continue under the new joint venture.

Continued development and commercialisation of large-scale wind turbine units will be crucial to the success of the joint venture as the offshore industry moves to increasingly large turbine sizes in a bid to reduce installation times and costs and make offshore wind energy more cost-competitive.

A joint venture with Gamesa will enable Areva to share the cost of turbine development and industrialisation of its offshore business.

It will also gain from Gamesa's technological capabilities in the wind sector, where it has been active for 19 years. The two companies said in a statement that one of their aims is "the application of efficient on-shore practices into offshore activities".

"By choosing to create a European offshore wind champion with Gamesa, Areva is playing a key role in the consolidation, already underway, of the offshore wind sector, and confirms its long-term commitment to renewable energies," said Luc Oursel, President and CEO of Areva.

The proposed joint venture will fulfill existing industrial development commitments both in the UK and France, that have until now been led by Areva, including the creation of a turbine assembly plant and blades manufacturing facility at Le Havre, France, and the implementation of a network of sub-contractors and partners.

Amec, Foster Wheeler in talks

Engineering firm Amec is aiming to increase its geographic and market exposure through a takeover of rival Foster Wheeler.

The London-based company has made a $3.2 billion cash and share offer for the US-listed firm, which has a global engineering, construction and project management business and which also supplies equipment to the power plant market.

Under the proposed deal, Foster Wheeler shareholders would receive approximately 0.9 new Amec shares plus $16 in cash per Foster Wheeler share, valuing the target company's shares at $32. Amec says it would seek a US listing if the deal is closed.

Amec says that the proposed takeover would increase its geographic footprint – particularly in key growth regions – as well as increase its presence along the whole oil and gas value chain. The annual cost synergies arising from the deal would amount to at least $75 million annually, said Amec.

Amec would also gain access to Foster Wheeler's Global Power Group, which specialises in the supply of steam generators and auxiliary equipment as well as in the design, construction and operation of power plants worldwide. The group has a "robust and profitable power equipment business with a solid backlog of orders", according to a statement.

Overall, Foster Wheeler employs 13 000 people in over 30 countries. Amec, which employs over 29 000 people and has annual revenues of £4.2 billion, says that the proposed deal is a "compelling proposition" that would generate "double-digit earnings enhancement in the first twelve months".

UK engieneering firm Amec would also gain access to Foster Wheeler's Global Power Group

Atlantis aims for £20m in IPO

Tidal power firm Atlantis Resources is planning to raise £20 million for its first commercial-scale installation through a listing on London's AIM market.

The Singapore-based firm says that up to half of the money raised through the initial public offering would fund the first phase of the MeyGen tidal project in Scotland. Atlantis bought the project in 2013 and could develop up to 398 MW at the site by 2020.

Atlantis says it will deploy up to 86 tidal turbines – equivalent to 86 MW – in the first phase of the project, starting with an initial demonstration of four turbines.

Atlantis is involved in the development of tidal projects and demonstrations in Canada, China, India, the UK and Australia. Bloomberg New Energy Finance says that although the industry is in its infancy, up to 170 MW of tidal capacity could be developed world-wide by 2020.

Alstom profits hit

Alstom says that subdued demand for its thermal power plant equipment has forced it to cut its outlook for the year.

The French engineering giant reported that orders in its thermal power division were weak because demand for conventional power plants was subdued in mature markets and has also slowed in emerging markets. It said that commercial activity in the services segment was good, and that orders in renewable power were "robust".

For the first nine months of 2013/14, Alstom's order intake reached €15.1 billion, a 12 per cent decrease compared to the first nine months of 2012/13. It said that the performance of its thermal power division would affect some key performance indicators, including free cash flow.

"In these conditions, we now anticipate for the group a moderately negative free cash flow in the second half of this year," said Patrick Kron, Chairman and CEO of Alstom. "The operating margin should remain around seven per cent this year and may slightly decline next year with the anticipated rebound being postponed.

"In this difficult environment, our focus remains on the implementation and acceleration of the ambitious cost savings initiatives which have been launched."

RWE reduces renewables investment

RWE is planning to make further cuts to its renewable energy investment budget as part of plans to reinvigorate its balance sheet.

The German energy giant told reporters last month that its renewable energy unit, RWE Innogy, would now be investing even less than the €500 million targeted for investment in 2014.

The firm recently announced it would be scaling back the size of the proposed Triton Knoll offshore wind farm in the UK and last year cancelled plans for the construction of the 1200 MW Atlantic Array offshore wind farm, also in the UK. It has hinted that it would also sell stakes in existing renewable projects in order to reduce its exposure to the sector, and seek partners for proposed projects.

RWE has not given details of the extent of the cuts, but further details are expected to emerge in early March when it reports full-year results.

In 2013 RWE invested around €1 billion in the renewables sector, and said that it would halve clean-tech spending for 2014 from €1 billion to €500 million.

The company's revised plans for Triton Knoll are for a 600-900 MW project, rather than 1200 MW. RWE said that the change would "make the site more competitive and more economic in line with government proposals to bring down the cost of offshore wind".

RWE in November 2013 cancelled the Atlantic Array project because the project's technical challenges made it prohibitive in current market conditions. Just a month later ScottishPower cancelled the 1200 MW Argyll Array offshore wind project.

Americas

Acciona signs 93 MW deal in Brazil

Acciona Windpower has signed a contract for the supply, operation and maintenance of 93 MW of wind capacity for wind farms owned by Voltalia, Chesf and Encalso.

The wind farms will be equipped with thirty-one AW125/3000 and AW116/3000 turbines of 125 and 116 m rotor diameter, respectively. They have the largest swept area designed by Acciona Windpower and are mounted on 120 m-high concrete towers.

The agreement covers the supply and installation of the turbines in the field and the operation and maintenance of the site for a period of 15 years. It is the fourth contract signed by Acciona Windpower in Brazil.

Tri Global selects Alstom

Alstom Power has entered into a turbine supply agreement with Tri Global Energy LLC under which Alstom will supply four ECO110 and 25 ECO122 wind turbines for the Fiber Winds Energy project in Texas, USA.

Following financial closing, construction of the project is expected to begin in mid-year 2014, with commercial operations scheduled to commence in 2015. Tri Global Energy recently acquired 100 per cent ownership of Fiber Winds Energy and intends to be the plant operator.

Financial close is expected for summer 2014.

Globeleq orders Gamesa turbines

Globeleq Mesoamerica Energy (GME) has placed an order with Gamesa to build, deliver and install a 50 MW wind farm in Costa Rica.

Gamesa will install 25 of its G87-2.0 MW wind turbines in the Orosí wind farm in Guanacaste region. It will also develop the infrastructure for the project's installation and operation, including an electricity substation, a high-tension line and the site's connection to the power grid.

Gamesa will also carry out operation and maintenance services at the wind farm for five years.

The project is being financed by multilateral funding from the US Ex-Im Bank, the Dutch Development Bank and the International Bank of Costa Rica.

Vengano expands wind farm

Vengano S.A. has signed an agreement for the extension of the Carape wind power plant in Uruguay using 13 Vestas V112-3.0 MW wind turbines.

The 39 MW contract comprises delivery, installation and commissioning of the turbines, a VestasOnline Business SCADA system as well as a 17-year service agreement, which guarantees turbine availability. This service option includes a surveillance system to remotely control and monitor the turbines as well as predict potential maintenance issues.

The wind turbines are scheduled to be delivered from the third quarter of 2014 and commissioned by the first quarter of 2015.

Siemens secures Cape Wind deal

Siemens and Cape Wind have signed a major contract for the construction of the first utility-scale offshore wind farm in the USA.

Under the contract, Siemens will supply Cape Wind with its 3.6 MW offshore wind turbines, an offshore Electric Service Platform (ESP) and a long-term service agreement. The project is situated off the Northeast coast, 20 km offshore of Nantucket, at Horseshoe Shoal in the Nantucket Sound.

Installation and commissioning is expected for 2016.

Asia-Pacific

Foster Wheeler wins Korea CFB deal

South Korean firm eTEC E&C Limited has awarded Foster Wheeler a contract to design and supply a circulating fluidised bed (CFB) steam generator for a cogeneration plant.

Foster Wheeler will design and supply the 250 MWe steam generator including a selective catalytic reduction (SCR) system and provide technical advisory services during erection and commissioning. The project is owned by Gungjang Energy Co., an affiliate of eTEC, and will be built in Gunsan City, South Korea.

The CFB steam generator will be designed to burn Indonesian sub-bituminous coal while meeting applicable environmental regulatory requirements. Commercial operation is scheduled for mid-2016.

Alstom secures Japan wind order

Green Power Investment Corporation has awarded Alstom a contract to supply and supervise the installation and commissioning of 29 wind turbines at a wind farm in western Japan.

Alstom will supply its 1.67 MW ECO 74 wind turbine model for the 48 MW wind farm, which is scheduled to be fully operational in 2016. The contract is the third won by Alstom in western Japan after orders for the Higashi Izu II and Kawuzu wind farms.

Trina signs agreement for 1 GW project

Trina Solar has signed an investment framework agreement to develop a 1 GW ground-mounted solar photovoltaic (PV) power plant in western China's Xinjiang region.

Under the agreement with the local government, Trina will build a series of PV plants in multiple phases over a four-year period, starting in early 2014. The first two phases of the project, with an installed capacity of 300 MW, are scheduled to be completed and connected to the grid by the end of 2014.

Trina says it will build a PV module production facility in the local area to supply the projects.

It will require approvals from State Grid and the local government before construction can start.

Europe

Parat wins German contracts

Norway's Parat Halvorsen has delivered two of its 20 MW, 10 kV electrode steam boilers to Infraserv Höchst in Frankfurt, Germany.

The contract, comprising complete boilers with control system, instruments and pumps, underscores Infraserv's growing awareness of the potential offered by Germany's developing market for secondary regulation.

The Parat boilers are scheduled to become operational towards the end of April 2014. They will be used for steam production to the 16 bar[g] steam network at a large-scale industrial park in Höchst and will be offered for balancing load in the secondary regulation market.

Parat's electrode boiler allows users to switch from cold to full load in less than 15 minutes, with 30 seconds from minimum to full load. Minimum load is 2 per cent. Power from wind and solar energy can be utilised in the boiler for steam or hot water purposes. Hot water can be stored during peak production periods, and utilised when needed in district heating.

Magnox signs £200 million contract

Magnox has signed framework contracts worth over £200 million ($320 million) for the supply of transportable self-shielded waste containers to store various types of intermediate level waste (ILW), generated during the operational and early decommissioning phases of the UK's Magnox nuclear power stations.

The six-year contract with three suppliers – Croft Associates Ltd, Chester-Simplex, and Siempelkamp Nukleartechnik GmbH – is in addition to the existing arrangements with GNS Ltd and will increase security of supply for the waste containers, which are central to Magnox's strategy for decommissioning and delivering eight of the ten nuclear sites into care and maintenance.

Magnox will require more than 2000 of these packages which, once filled, will be stored in purpose-built facilities at nuclear sites until the UK's national repository becomes available. The first orders will be for 50 containers from each supplier and will be placed early in 2014.

Nordex signs contracts for Turkey

The Nordex Group has been awarded three new contracts for a combined capacity of 37.6 MW in Turkey.

The contracts include the first six N117/3000 generation Delta turbines sold by Nordex into Turkey, which the firm considers to be a growth market.

Nordex will supply six N117/3000 turbines for the 18 MW Cesme RES project, four N117/2400 turbines for the Aliaga RES project, and four N100/2500 turbines to extend the existing 45 MW Akres wind farm.

Turkey orders Siemens H-class

Enerjisa has placed an order with Siemens for the turnkey construction of the Bandirma II combined cycle power plant in Turkey.

The order is Siemens' second from Turkey for its H-class technology following the Samsun project. Bandirma II will feature an SGT5-8000H gas turbine and is scheduled for completion in the spring of 2016.

Bandirma II will be built on the southern coast of the Sea of Marmara, near the city of Bandirma in the Balikesir province. Siemens' scope comprises not only the turnkey construction of the plant, but also the supply of the main components, including the gas turbine, a model SST5-5000 steam turbine and an SGen5-3000W water-cooled generator, the entire electrical system, a 400 kV high-voltage switchgear installation and the SPPA-T3000 instrumentation and control system.

The scope also includes a Benson-type heat recovery steam generator manufactured by NEM and the auxiliary and ancillary systems. Siemens also signed a long-term service contract for the major components, the gas turbine and generator.

Denmark commits to smart grid

Kamstrup has won an order from MV Group, a consortium of eight Danish utilities, to supply 153 000 smart meters over a three-year period.

The deal will enable MV Group to rollout its smart grid programme and improve grid management and administration. "With these meter replacements, we are looking forward to offering the most modern technology on the market to our customers, who will be able to follow their energy usage in detail and decrease it accordingly," said an MV Group spokesperson.

International

SEC plans CSP capacity

Saudi Electricity Company (SEC) has called for expressions of interest for developers to build, own and operate Saudi Arabia's first commercial-scale concentrated solar power (CSP) plant.

The Duba 1 independent power plant will be an integrated solar combined cycle (ISCC) facility with a capacity of 550 MW. It will be located 50 km north of Duba on the Red Sea coast and is expected to draw a lot of interest from the international CSP market.

Duba 1 will integrate a parabolic trough solar CSP island of 20-30 MW capacity with a gas-fired combined cycle power plant running on natural gas. The steam generated by the CSP will be used to drive the plant's steam turbines and augment its output.

The winning developer will be expected to sell the entire output from the planned plant to SEC under a power purchase agreement.

Israel plans first pumped storage plant

Alstom has signed two contracts totalling €120 million with PSP Investments Ltd. for the supply of two 150 MW pump turbines for the 300 MW Gilboa pumped storage power plant in Israel.

Gilboa will be Israel's first pumped storage hydropower plant and the project represents Alstom's first entry into the Israeli hydro market. Located 60 km east of Haifa, the plant will be commissioned in 2018 and will boost the country's installed power generating capacity by 2.5 per cent.

ABB wins Saudi power orders

ABB has won orders worth over $60 million for substations that will boost transmission capacity and supply electricity to the King Abdullah Economic City (KAEC) in Saudi Arabia.

The substations will strengthen the transmission grid and boost power supplies to support economic growth. ABB will supply its gas insulated 380 kV switchgear technology for the project, as well as control and protection equipment, auxiliary systems and substation automation equipment.

Jordan orders Vestas turbines

Vestas has won an order to deliver 177 MW of wind turbines to a project in Jordan.

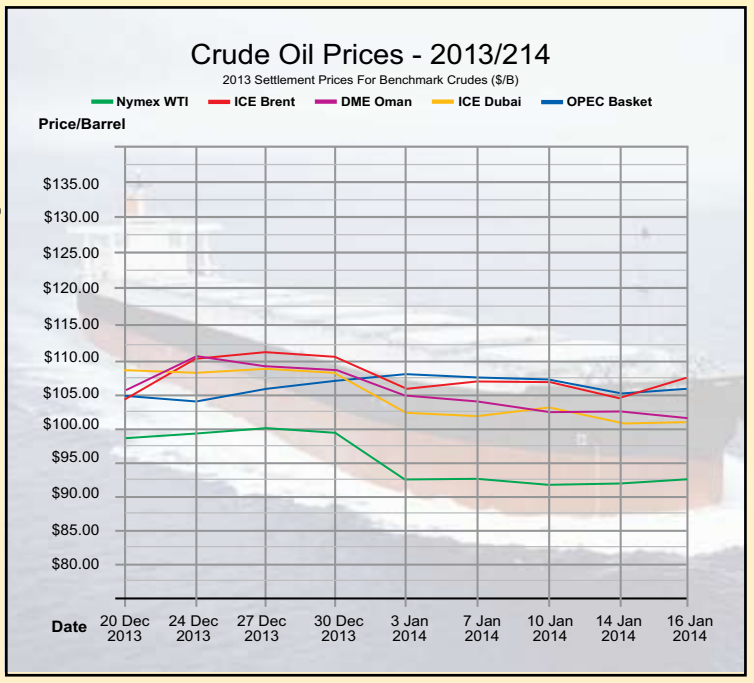
The project consists of 38 V112-3.0 MW turbines, which will be installed about 180 km south of Amman, in the Tafila region, Jordan. Delivery of the turbines will start in the second quarter of 2014, and the wind power plant is expected to be commissioned in the second quarter of 2015.

The contract for the Al Tafila wind power plant includes supply, installation and commissioning of the wind turbines, civil and electrical works, a VestasOnline Business SCADA solution as well as a 10-year custom-designed energy based service agreement for the entire wind power plant.

Oil

Crude prices enter 2014 trending lower as supply improves

- US and Libya production increasing
- Opec may face prospect of cutting production



David Gregory

Prices for West Texas Intermediate (WTI) crude and North Sea Brent are expected to average $93/b and $105/b respectively during 2014, the US Energy Information Administration (EIA) said in its January *Short-Term Energy Outlook*. For 2015, it reduced the price averages further, forecasting $90/b for WTI and $102/b for Brent.

The US economic position appeared to be making improvements in mid-January, with crude oil production gaining. At the same time Libyan crude supplies are returning to the market, and crude oil produced in Iraqi Kurdistan and shipped through Turkey for export is expected to start soon.

Lower crude prices may not be the best news for oil producers but are seen as essential for further economic improvement, which in turn could improve oil demand.

Opec reported in its January monthly report that production amongst its members averaged 20 000 b/d lower in December at 29.443 million b/d. Demand for Opec crude is expected to average 29.58 million b/d for 2014. Opec forecast in its latest monthly report that global crude demand for 2014 would average 90.91 million b/d and non-Opec supply would average 55.38 million b/d. Opec estimated its natural gas liquids and unconventionals, which it does not include in its crude supply category, at 5.95 million b/d.

The Opec report said Saudi Arabia produced 9.819 million b/d last December, while Libya's crude output was put at 228 000 b/d.

Media reports in mid-January reported that some Libyan production in the western part of the country was coming back on line as protesters agree to stop obstructing oil fields, infrastructure and export terminals. But continuing differences with militias in the eastern part of Libya could prevent exports from that region making it to global markets.

International sanctions against Iran are reported to have taken about 1 million b/d of Iranian crude off the market, and it remains to be seen what impact the new agreement between Tehran and the P5+1 group to ease the sanctions will have. The eventual return of Iranian crude to the market is likely to lead to complications within Opec.

Opec reported in its latest monthly report that Iran produced 3.22 million b/d in December, but secondary sources estimated Iranian output at 2.73 million b/d.

According to direct submissions to Opec by its member countries, total Opec production during December averaged 30.893 million b/d.

Iraq, Libya, Algeria and Iran all have aspirations to boost crude production by the end of the decade. Should that happen, it will be curious to see how Opec as an organisation handles the increases in supply. Production allocations are based on reserves and so adjustments in Opec member production allocations will likely see some political hardball within the group.

Furthermore, if more non-Opec supply becomes available to global markets and prices begin to decline, Opec will have to face the prospect of cutting overall production in an effort to maintain prices at levels that the budgets of member countries require to meet domestic economies. But how much production would Opec's members be willing to cut in order to maintain the prices they have become accustomed to?

According to the EIA January report, liquid fuels production from non-Opec countries will "grow year-over-year by a record high of 1.9 million b/d in 2014." It said the US and Canada are projected to account for almost 70 per cent of total non-Opec supply growth this year.

Total US crude output averaged 7.5 million b/d in 2013 the EIA reported, up by 1.0 million b/d over 2012. "Projected domestic crude oil production continues to increase to 8.5 million b/d in 2014 and 9.3 million b/d in 2015," the EIA said, adding that the 2015 forecast would mark the highest annual level of production since 1972.

Crude production is also expected to increase in Brazil, and in Kazakhstan, where the North Caspian Operating Company (NCOC) is currently struggling to solve infrastructure problems at the offshore Kashagan oil field, which started production in September, but has been forced to close because of gas leaks in pipelines connecting the wells and onshore processing facilities. When Kashagan does come on-stream at full planned capacity, it will produce 1.5 million b/d, putting Kazakhstan's production capacity at more than 2.5 million b/d by the end of the decade.

Gas

Stage set for Southern Gas Corridor

Shah Deniz 2 and the Southern Corridor pipelines will change the energy map and give Europe direct access to Azerbaijani gas resources for the first time.

Mark Goetz

The final investment decision taken in mid-December by the BP-led partners in the Shah Deniz Stage 2 (SD2) development project sets the stage for the creation of the long-anticipated Southern Corridor that will deliver Azeri natural gas to Europe by the end of the decade.

The project involves an investment of $25 billion and will boost production at Azerbaijan's offshore Shah Deniz field to 26 billion cubic metres per year (bcm/year). Operator BP will install two offshore platforms and drill 26 wells that will increase the field's output by 16 bcm/year, adding to current production of 8 bcm/year.

Shah Deniz came on-stream in 2006 and through the South Caucasus Pipeline (SCP) supplies Georgia and Turkey with natural gas. Turkey, which already receives around 6.6 bcm/year of Azeri gas, will receive another 6 bcm/year as of 2018. In 2019, the remaining 10 bcm/year of SD2 gas will enter Europe.

The further development of Azerbaijan's offshore Shah Deniz field has depended on the completion of gas sales agreements and the selection of a pipeline route. The consortium last September signed 25-year gas sales contracts worth $100 billion with nine European companies for the 10 bcm/year.

The list of buyers are: Axpo Trading AG, Bulgargaz EAD, DEPA Public Gas Corporation of Greece, Enel Trade SpA, E.On Global Commodities SE, Gas Natural Aprovisionamientos SDG SA, GDF Suez, Hera Trading, and Shell Energy Europe Limited.

Signing those contracts brought to a conclusion the rivalry of two major gas pipeline projects – Nabucco West and the Trans Adriatic Pipeline (TAP). In June 2013, the SD2 partners chose TAP as the route they would use to ship gas to Europe.

The Nabucco Gas Pipeline project launched the idea of a Southern Corridor roughly 10 years ago when its Central and East European backers proposed to build a new 31 bcm/year capacity pipeline from the Georgia-Turkey border to the Central European Gas Hub in Baumgarten, Austria.

The economics of Nabucco failed to work. Instead, SD2 partners chose to ship gas through the Trans Anatolian Gas Pipeline (TANAP), which will run across Turkey from Georgia to Greece, and TAP, which will stretch across northern Greece, Albania and the Adriatic Sea to Italy from where it will run into Central Europe.

"The [final investment] decision triggers plans to expand the South Caucasus Pipeline (SCP) through Azerbaijan and Georgia, to construct the TANAP pipeline across Turkey and to construct the TAP pipeline across Greece, Albania and into Italy," a statement released by the consortium said. "Together these projects, as well as gas transmission infrastructure to Bulgaria, will create a new Southern Corridor to Europe."

The SD2 project involves expanding capacity at the Sangachal processing terminal south of Baku and the throughput capacity of the SCP with a section of new pipeline and two new compressor stations.

"Very few projects have the ability to change the energy map of an entire region," BP Group Chief Executive Bob Dudley said during the signing ceremony in Baku on December 17. "Shah Deniz 2 and the Southern Corridor pipelines will not only change the energy map, but will give customers in Europe direct access to the gas resources of Azerbaijan for the first time."

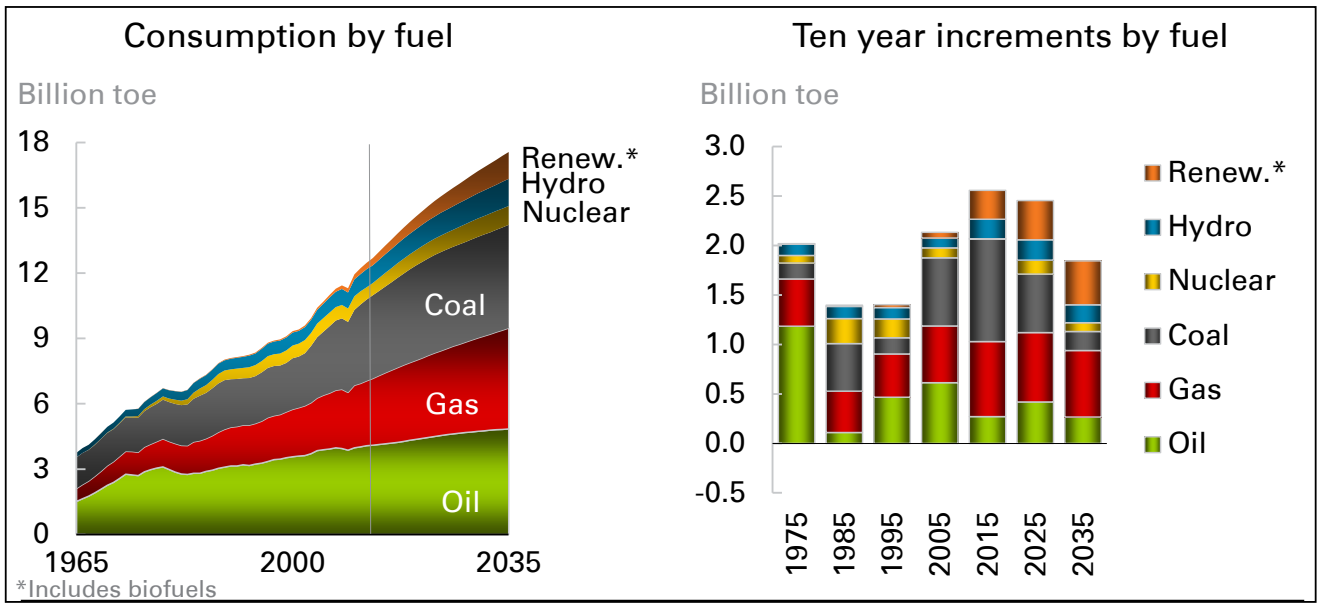
The Southern Corridor will create a new source of gas supply for Europe, which depends on Russia to meet about 25 per cent of its demand. Moscow had opposed the new route from the start and in 2007 launched its South Stream project as an alternative to Nabucco.

Opening the Southern Corridor will provide Europe with improved energy security and boost Azerbaijan as an international energy player. Azerbaijan's state-owned oil and gas company is leading the consortium behind TANAP, which includes BP and Turkey's Botas and Socar, has recently purchased a majority stake in Greece's natural gas transport company DESFA. Greece will purchase about 1 bcm/year of SD2 gas and Bulgaria will receive the same amount through the Interconnector-Greece-Bulgaria pipeline project.

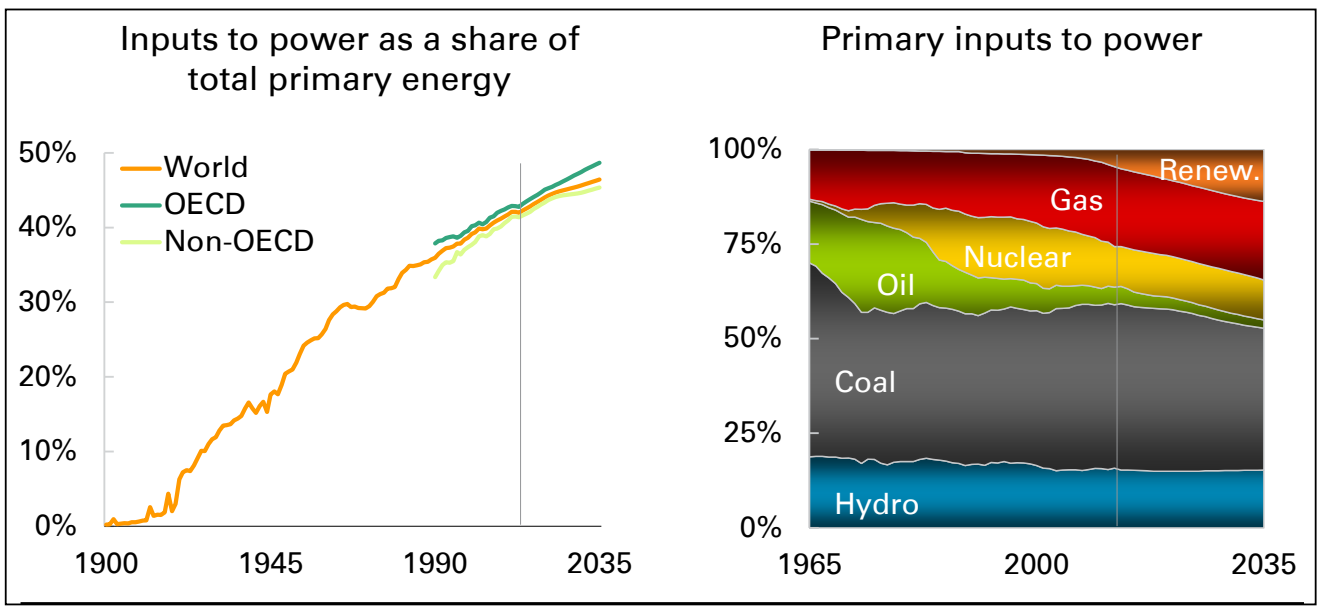
Shah Deniz is estimated to hold more than 1 trillion cubic metres (tcm) of natural gas in place, and altogether Azerbaijan is estimated to have gas reserves of around 3 tcm.

A number of other gas fields exist that are expected to come on-stream near the end of the decade and Baku sees this as future supply for the European market.

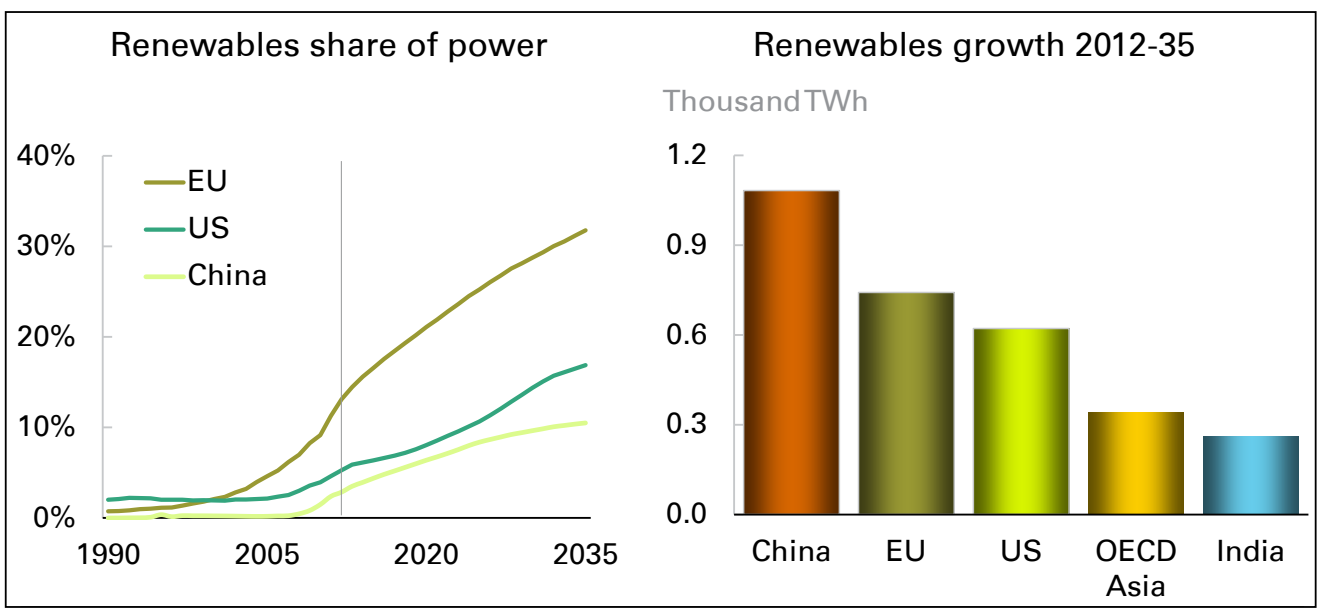
The slowdown in China and industry is reflected in coal



The power sector takes an increasing share of energy



Renewables in power gain share most rapidly in Europe



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Can EU market design deliver?

Decarbonisation of the electricity sector is central to Europe's plans to reduce carbon emissions in an effort to tackle climate change. But the policy and market design framework for delivering decarbonisation remains uncertain.

Simon Bradbury

It is clear that the EU has a long-term objective of decarbonising its electricity sector but the market design framework for achieving this remains uncertain. The current focus of European energy policy is firmly on developing integrated and market-based solutions, as exemplified by implementation of the European Electricity Target Model planned for 2014. Yet looking further into the future, there is a question mark as to whether this will persist.

Many stakeholders advocate a market-based approach, with a strong CO_2 pricing regime driving low carbon generation investment. However, national solutions with government-channelled investment are increasingly being used to deliver the 'required' mix of generation.

Consequently, Europe is facing a policy dilemma: rely on markets or regulated support payments?

In examining how European electricity markets could evolve to meet the decarbonisation challenge, it is necessary to consider issues such as:

- the nature of the decarbonisation challenge itself;
- the carbon pricing, market-led route; and
- the support payment route.

A critical underlying factor behind a credible electricity market is acceptance from the energy customer that the costs of decarbonisation are acceptable and therefore that they are willing to pay for it. Conversely, a short-term focus on energy prices undermines the ability of governments to offer longer-term credibility to investors.

Decarbonisation itself faces several challenges. It relies increasingly on technologies that are currently immature. The current long run supply curve for low carbon technologies has distinct step changes, given varying capex requirements and short-run cost characteristics. Greater reliance on immature technologies increases uncertainty regarding the future supply curve and the potential for further/larger step changes.

As a result, the overall cost outcome (and in some respects the feasibility, at least in terms of credible timelines or the balance of supporting investment which is needed) is highly uncertain. In essence, the cost outcome is dependent on the development of technologies that are not fully commercially or technologically established, and whose future development is unclear.

The allocation of decarbonisation costs varies between countries depending on their carbon intensity starting point, resource availability and the consequences that it has for fuel imports and exports. That different markets face different cost exposure may necessitate political agreement on funding arrangements to avoid deadlock.

There is increasing discussion on whether the decarbonisation challenge should be met through the carbon pricing, market-led route. There is a general philosophical preference for market-based solutions – Absolute Markets (AM) and Dual Support (DS). This is based on presumed benefits of open markets and competition in driving efficient outcomes, relative to more regulated solutions, which inevitably involve some degree of central planning and state intervention. But reliance on carbon pricing is not without its issues:

Carbon markets are a political construct. As such the carbon regime is entirely open to future policy change. We live in a democratic society in which legislative frameworks can (and must) evolve in response to changing political and public will (as well as potential changes in the underlying science).

However, the economic life of a generation asset spans multiple political cycles – something that has led to the creation of independent regulators at country level, shielded to a certain extent from regular political policy changes. Policy changes can occur during an asset's lifetime that can undermine its commercial and/or operational prospects. Without project-specific support, investors will need to form a view of the carbon price trajectory and the resultant power price for the economic lifetime of the project.

Critically, this needs to be bankable. Any deviation between outturn carbon (and therefore electricity) prices and those anticipated at the point of investment results in the risk of financial exposure, increasing project costs (risk premia) or delaying investment.

Importantly, any policy change that results in a downward impact on future carbon prices affects all low carbon plants, existing and new alike, as all rely on a common carbon price, and there are no obvious ways of hedging this political risk. The 'market' pathway for decarbonisation therefore relies heavily on the credibility of the carbon scheme for long periods into the future.

Delivering low carbon investment without direct support requires a carbon price (and associated wholesale electricity prices) that can incentivise delivery of the marginal low carbon technology. However, as the generation mix becomes less carbon intensive, the influence of the carbon price on wholesale electricity price formation starts to reduce. There are, therefore, diminishing returns from increases in carbon prices.

Combined with the lumpiness of the supply curve and uncertainty regarding future costs, this means that the future carbon price required to drive further decarbonisation ultimately becomes high, uncertain and sensitive to marginal technology costs. This is illustrated in Figure 1. It shows the implications of higher and lower 'flexibility' (from demand response) in the electricity system, a less optimistic view of the development of carbon capture and storage (CCS) and nuclear costs, and a hybrid case in which the CO_2 price is limited.

A carbon pricing solution is technology neutral; with the marginal carbon price, through its influence on the wholesale price, forming an important element of remuneration for all low carbon investors. It is not possible to price discriminate between different low carbon options and offer differentiated or banded support to individual technologies/projects based on underlying costs. This provides incentives for delivery of cheaper alternatives as it allows infra-marginal rent to be earned. As a consequence, it delivers substantial gains to existing nuclear and hydro and to onshore wind generation, funded, ultimately, by the consumer.

Considering the support payment route to decarbonisation, recent experience suggests growing reliance on national, government administered support schemes to stimulate investment in low carbon generation technologies. However, continued dependence upon support payments presents its own issues.

Support regimes require central planning to varying degrees, risking inflated costs through inefficient decisions on location, technology choice and payment. Additionally, existing support mechanisms distort price and dispatch whilst still leaving volume risk, which becomes an ever greater issue under the existing 'production based' support schemes. As penetration of 'autonomous-fuelled' generation increases, the ability for all low carbon generation to be accommodated on the system becomes more problematic. Ultimately, not all generation can run in all circumstances.

This issue is particularly pertinent for low carbon generation that has a positive short run marginal cost (SRMC), such as CCS or biomass. Finally, linking support payments to RES targets can, without specific adjustment, have a distortionary impact on CO_2 price and other carbon abatements. It can also have a distortionary impact on the balance of investment across the range of low carbon generation options.

There are some crucial considerations in choosing a pathway to decarbonisation. The 'markets' approach requires a credible long-term policy framework and delivers the conventional market results: risks, profits and innovation to deliver lower cost solutions. The balance must ultimately be acceptable in the short and long term to the voters and customers for long-term credibility to be possible. Conversely, the regulated approach includes a centralist view, which mitigates market risks but may in turn stifle innovation and efficiency and thereby deliver higher overall costs to consumers.

The next phase of power sector decarbonisation can be delivered with the carbon price gradually rising to €70 /tCO_2, before issues of diminishing returns intensify and the range of potential future carbon prices widens. Power sector carbon intensity can be reduced from 350 g of CO_2/kWh to around 150 g of CO_2/kWh with a carbon price below approximately €70 /tCO_2.

Some of this reduction can be attributed to the impact of renewables investments expected in the immediate future as a result of existing direct support payments or those that are already locked in for investments already planned to 2020 and it is important that commitment to make support payments to these projects is not reneged upon.

The key components of our recommended policy approach are as follows:

- Commit now to a clear carbon pricing framework to deliver the next phase of power sector decarbonisation to 2030
  - From today's starting point, this requires improved institutional credibility (e.g. independent carbon bank, pre-defined adjustment mechanisms) and, where possible, international agreements and consumer acceptance of the implications of pursuing decarbonisation.
- Pursue policy initiatives that support the effectiveness of carbon pricing
  - Governments should pursue cost reductions for critical low carbon technologies, including nuclear, offshore wind and solar technologies.
- Build in option for structured transition to incremental support in future
  - We have identified a potential 'divergence point' linked to diminishing returns from incremental carbon price increases which may, in time, impair the effectiveness of carbon pricing and may necessitate a transition back to incremental support payments to deliver the highest cost technologies in the future.
- Enhance existing support payments, balancing revenue certainty and short-term efficiency
  - There is an option to switch to new forms of revenue support scheme, not paid on output, which would improve longer-term certainty while providing commercial exposure to short-term operation of the wholesale market and thus improve incentives for efficiency.

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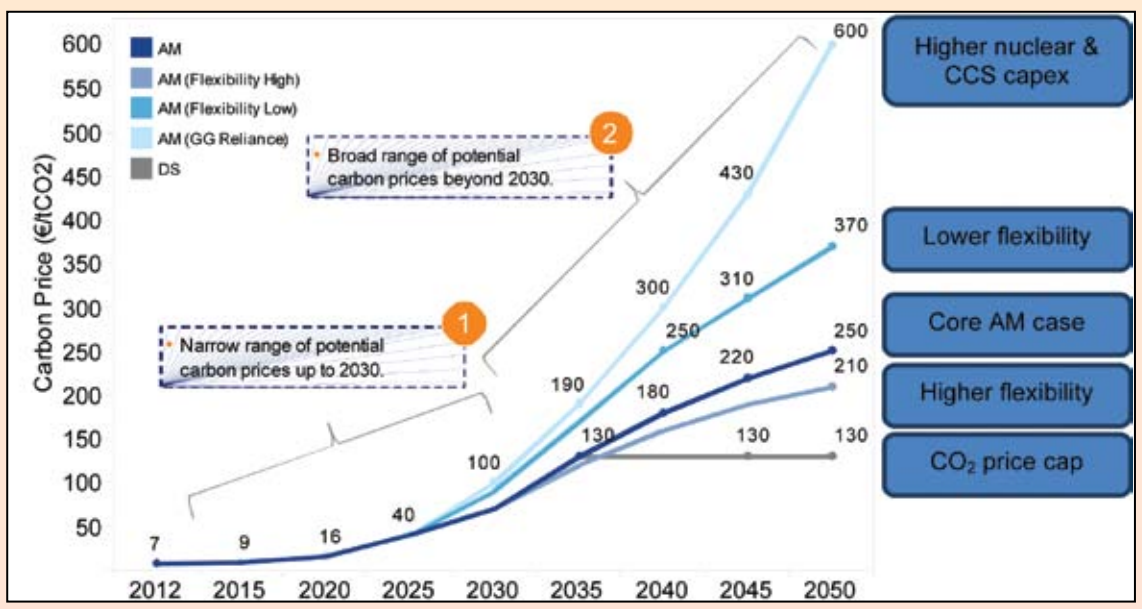
Potential carbon price trajectory under different markets cases.

Notes: GG reliance (Greater green reliance) refers to a sensitivity with higher nuclear and CCS capex and so more use of RES; AM (Absolute Markets); DS (Dual Support)



Market-based solutions

	Absolute Market (AM)	Dual Support (DS)
National carbon intensity targets	None	None
Renewable energy source targets	None	None
Power sector CO_2 price cap	None	Moderate
Support payments	None	Available

Valuing flexible generation

The need for flexible generation sources is becoming more acute but there is still a lack of consensus on how to do this in the least cost way, or how it should be incentivised. **Junior Isles**

As the US and other countries in the EU increase their use of renewables, the need for balancing resources to ensure that generation equals demand in real-time is becoming more acute. While electricity balancing is critical for ensuring security of supply, how it is implemented has an important bearing on the cost of electricity to customers.

Reason for optimism: Patel says flexibility is "right at the heart of the energy agenda"

Certainly at the pan-European level the debate around electricity balancing is gaining momentum. On 23 December 2013, ENTSO-E (European Network of Transmission System Operators for Electricity) delivered the Network Code on Electricity Balancing and Supporting Document to the Agency for the Cooperation of Energy Regulators (ACER).

The thinking is that balancing resources could be effectively shared between countries – to enhance security of supply and reduce cost – and there is therefore a strong rationale for developing cross-border balancing markets. The Network Code on Electricity Balancing will ensure that the correct framework will be put in place for this to happen.

Work has also been ongoing at the national level to identify the most cost-effective technology for balancing resources – even if the market mechanisms are not yet in place to incentivise those technologies.

Ilesh Patel, Partner at Baringa Partners LLP, a management consultancy specialising in the energy, financial services and utilities markets in the UK and continental Europe, commented: "In the UK and Germany regulators are looking at fairly substantial ways of changing the market design to provide better price signals [to reward flexible power generation for balancing]."

Redpoint Energy, a business of Baringa Partners, conducted a study just over a year ago on behalf of Wärtsilä, the Finland-based supplier of marine solutions and power plants based on reciprocating engines. The study analysed the value of using what Wärtsilä calls 'Smart Power Generation' (SPG) to provide the growing amount of flexible balancing capacity that will be needed in the UK as it moves towards hitting its wind power generation target in 2020.

There are several technologies for providing balancing services to grid operators, e.g. storage, through interconnections, thermal generation (gas turbine-based generation, coal plants, reciprocating engines) and demand side management.

Today, the flexibility needed in the UK system is predominantly provided by ramping gas fired combined cycle gas turbine (CCGT) and coal plants up and down according to requirements. These plants, however, are designed to run at baseload and are therefore not as efficient when operating at part-load. There are also limits to their flexibility in terms of ramp-rate and how far they can be turned down.

The study states that instead of focusing on part-loaded conventional generation to provide the increased flexibility needed in the future, electricity markets need to embrace new forms of flexible generation such as forms of SPG.

An SPG source is essentially a power plant of 10 MW to 500 MW made up of a number of reciprocating engines that can be individually turned on or off according to load demand. The remaining engines are run at full load to maintain maximum overall plant efficiency. The advantage of using reciprocating engines is that they can start fast enough to compensate for any sudden drop-off in renewable generation and so do not have to be kept running

Renewable targets for the UK aim for 30 per cent of electricity from renewables in 2020. The bulk of this, about 30 GW will come from wind. According to National Grid nearly 6000 MW reserve will be needed even when there is no wind generation. When wind generation is on the system, however, this amount of reserve will vary widely and as much as 12 000 MW could be needed at certain times.

Matti Rautkivi, General Manager, Liaison office, Wärtsilä Power Plants said: "National Grid proposed that 4.8 GW of new CCGT plant is the most affordable option to provide this reserve flexible capacity. At this point we thought, we have very flexible gas generation in our portfolio and asked why National Grid is not considering this option."

The study replaced the proposed new CCGT generating capacity with 4.8 GW of SPG. A power market simulation tool was used to determine the least-cost dispatch of generators in the market, and also to simulate the actions the system operator would have to take to create the flexible reserves of energy needed to integrate wind (known as reserve creation), and any constraints caused by the GB network configuration.

This allowed the comparison of the costs of creating flexibility using SPG compared to the costs of creating flexibility using CCGT.

According to Redpoint, the modeling indicated that £381-£545 million ($609-$872 million) per annum could be saved in 2020 without any additional investment costs. "This is a 54 per cent saving in system balancing cost," said Rautkivi. Savings are estimated to be even higher in 2030.

"Also, because the plants can start quickly and therefore do not need to be run unnecessarily, overall emissions will also be lower," he added.

It is a similar story in parts of the US. Kema DNV, performed a similar analysis on behalf of Wärtsilä for California. The state, which has the most ambitious renewables programme in the country, has targeted 33 per cent of generation from wind and solar by 2020. According to the California Independent System Operator (CAISO), on a typical day in the year 2020, this will require 13.5 GW of capacity to ramp up in two hours and shut down again just two hours later.

CAISO proposes that 5.5. GW of new gas fired capacity will be used to tackle the flexibility challenge it is facing. It is proposing that this is evenly split between combined cycle plant and open cycle gas turbine peaking plant. Again the study calculates the savings that could be made if this 5.5 GW is replaced with SPG and concludes that $890 million per year could be saved.

"We are not talking small numbers here, notes Rautkivi, "This represents 11 per cent of the system operating cost."

He adds: "By letting SPG take care of the flexible generation, you can let the large coal plant and gas fired fleet run at full load where they are most efficient. This means the operation of the overall fleet is optimised."

A number of SPG plants have been sold in the US where the market rewards plants that can provide ancillary services. In the EU, however, the task of incentivising this type of generation is still a work in progress.

There are system operator initiatives in the UK and Germany. National Grid is looking at incentives to provide more flexible sources of demand and generation through initiatives like the Demand Side Balancing Reserve Product. Meanwhile, Germany is proposing the Netzreserve.

There are also market design initiatives. ACER and ENTSO-E are specifically looking at how balancing works across Europe. The Balancing Network Code is examining market design harmonisation changes that would provide better price signals to reward flexible power generation. At the same time, domestically, regulators in the UK and Germany are also analysing ways to substantially change the market design in order to provide better price signals.

On this point, Patel says: "Today energy markets do not reflect the full value of scarcity when you need it most. So there is a 'missing money' problem for flexible generation, which is only rewarded exactly when it is needed, minute-by-minute rather than over the year. Investors, who are investing over 15 years need to have confidence that they will be rewarded in order to earn a reasonable return over that period."

Flexible generation in the form of reciprocating engines is a mature technology that has been around for decades in developing countries. In Europe and developed markets, however, it is in some ways an emerging technology in terms of how it can be applied to the new market challenges.

Balancing resources continues to be an interesting area of discussion and Baringa is looking at conducting a study similar to the one done in the UK but this time for Germany.

"We will be looking at some of the grid challenges posed by solar and wind, and the value of flexible power there," said Patel.

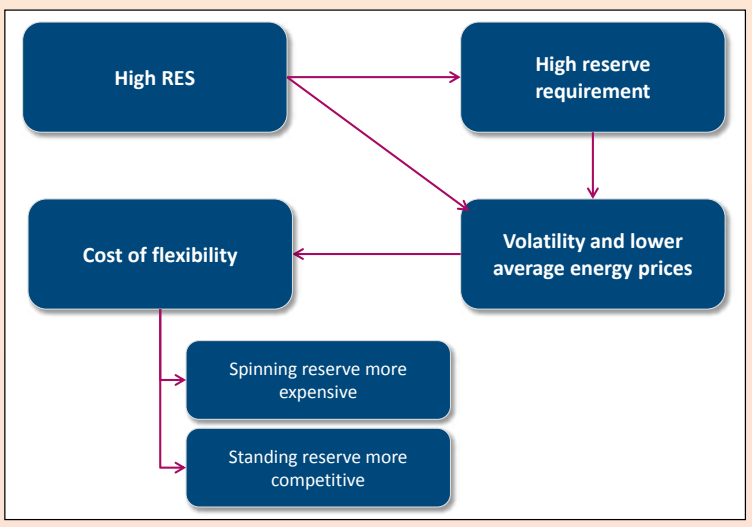
While the economic case for flexible generation is clear – for the market, consumers and investors – there is still some way to go in providing the right regulatory environment for flexible energy sources to be deployed.

"It is moving in the right direction in terms of debate. But there is a lot of work to be done and we need to see some practical action soon," said Patel.

"There is reason for optimism in that flexibility is right at the heart of the energy agenda but there is also reason for pessimism. The required consensus and buy-in from a range of stakeholders with competing interests requires a vision of what the energy market design to support high levels of renewables should look like. There are lots of visions out there but direction is needed from regulators and governments."

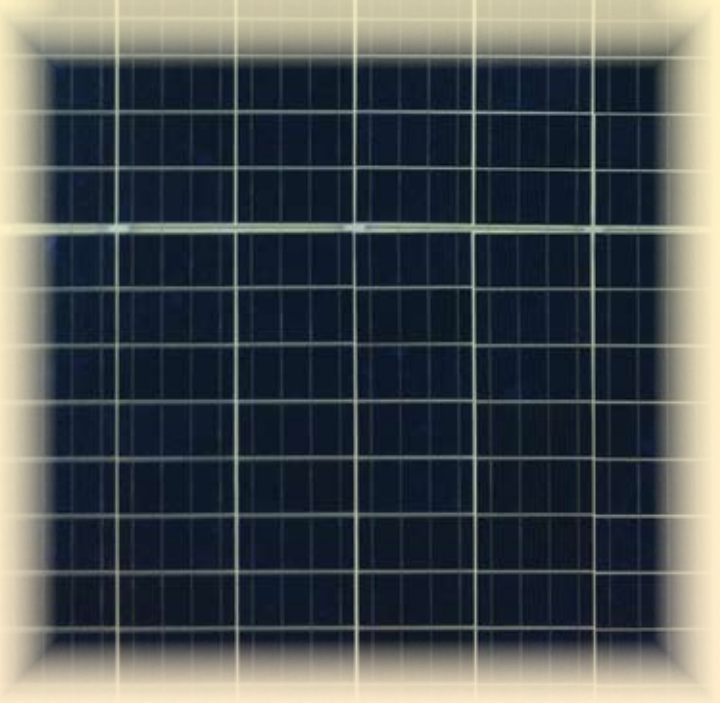
Rautkivi: "We are not talking small numbers here. This represents 11 per cent of the system operating cost"

The relationship between energy, reserves and flexibility



Better performance at half the size

Half-cut cells are designed to boost the energy yield of solar PV panels. ***TEI Times*** hears what one recently unveiled concept might mean for the industry.



Half cut cell technology essentially cuts traditional cell size in half so that modules can be made of 120 half cut cells with lower resistive losses and thus higher efficiency

The desire to reduce total system cost is one of the main drivers behind the development of new solar photovoltaic panel technology. One way of lowering cost is by increasing panel efficiency.

Today's polysilicon solar panels typically have an efficiency of up to 16 per cent, and a cell efficiency of around 17-18 per cent. With the industry beginning to hit a ceiling, manufacturers are looking at ways of making higher efficiency panels with existing materials and technology. One way of achieving this is through the use of half cut cell technology.

Typically solar panel are made up of 60 full size cells measuring 156 mm x156 mm. Half cut cells essentially cut this cell size in half so that modules can be made of 120 half cut cells with lower resistive losses and thus higher efficiency.

In October REC, a leading global provider of solar energy solutions, unveiled its latest half cut cell technology concept, which it believes could deliver improved performance.

Speaking at the time of announcement, Luc Graré, Senior Vice President, Sales and Marketing, REC, said: "Advances in technology, such as half cut cells, are vital steps in bringing the most innovative solar technology to all segments – residential, commercial and industrial as well as large-scale power plants."

Seber: We are not yet ready to put a stick in the ground but obviously if you can increase your energy yield, that would be a great thing to have

Certainly the ever-increasing rise in energy prices is driving demand for more efficient and cost-effective electricity production.

Cemil Seber, Director of Product Marketing & Global Expansion, REC said: "Higher efficiency is a key driver. There is a lot of interest in the PV market because it produces a product that basically provides a cash flow – for investors and residential customers. This cash flow is a function of energy yield, i.e. the kilowatt-hours per kilowatt peak that I can get out of the system. Our design helps in moving in that direction."

While several manufacturers are working on half cut cells, REC believes that it will be among the first to commercialise the technology.

"Half cut cell concepts have been around for some time. Several manufacturers have shown their concepts, each using them in a different way, but we have not seen any manufacturers using half cut cells in mass production," Seber commented.

"Ours is still in the R&D phase but we believe we can, firstly, get a higher watt peak at STC [Standard Test Conditions] level. And secondly, because of the lower resistive losses, we also believe that at higher irradiance levels, we would get better energy yield."

REC's half cut cell will retain the same voltage and current used in its existing full size cells.

Seber noted: "It is very important not to increase the voltage. We want to try to ensure that the same number of modules can still be mounted in a string, i.e. 20-22 modules. A couple of different designs are being tested but we will probably go for the one that allows us to keep the same current and voltage being used today."

Seber is careful to stress, however, that the technology is still very much under development. "Although it was showcased in October, it will take 6-12 months before we finalise it."

One of the challenges in development will be the operational/technical challenge of how to produce the cells. Producers of full size cells will need technology and ways of producing these half cut cells efficiently. Cutting cells in half is one key issue that needs to be overcome. Industry players like REC will no doubt have to work with different equipment suppliers and test technologies to see how this can be best achieved.

While certain aspects of module manufacturing can remain almost unchanged, significant investment will therefore be needed in current production lines, or new production lines may have to be built.

A key requirement will be to develop equipment that is able to cut cells in half and then handle the half cut cells with regards to soldering and lamination etc.

When REC's commercial product is finally available, Seber says it will be a "universal" module in terms of specification and mounting, making it suitable for commercial/industrial and residential installations as well as utility scale projects.

"Obviously higher efficiency modules are optimal where space is limited. So we see them being good for rooftops – potentially the residential business or on commercial/industrial rooftops such as supermarkets, warehouses etc. We are not excluding utility projects, which may also have a demand for such a product, but we see them more in the residential, commercial/industrial sector. We are always trying to maximise the kWh/m^2. You can't increase the amount of space on a roof but you can increase the amount of energy you produce on the roof."

> One of the challenges in development will be the operational/technical challenge of how to produce the cells

Feed-in-tariffs and improvements in storage systems are making self-production economically for both businesses and homeowners. For example, according to the Fraunhofer Institute solar accounted for 6.9 per cent of Germany's electricity generation between January and July last year.

During the third quarter of 2013, 930 MW of solar PV was installed in the US – the second largest quarter in the industry's history and the largest quarter ever for residential PV installations.

But even as solar continues its remarkable growth, the gradual reduction of subsidies will require installations to be more efficient in order to maintain a reasonable economic return. The focus on half cut cells and other methods of improving cell performance is therefore timely.

As REC's product development is still in the R&D phase, it is difficult to give an accurate prediction on what the precise economic benefits will be to customers. "We see some improvement in energy yield," said Seber. He claims that the expected improvement "already justifies" having these modules instead of traditional full size modules.

"We are currently looking at quantifying how much better a half cut cell is compared with a full size cell in terms of energy yield. We are not yet ready to put a stick in the ground but obviously if you can increase your energy yield, that would be a great thing to have."

REC says the price of the modules will be "comparable" with existing modules with "maybe a slight premium", depending on the improvement in energy yield.

This is to be expected as modules are sold on a €/Wp basis and a watt-peak produced by a full cell module cannot be compared to what would be produced by a half cut cell solar module. This would allow users to increase cash flow since they would have a module that produces more power for the same surface area. Also, if it can be proven that energy yield is improved by a significant amount then it is likely that users would be willing to pay a premium.

Nevertheless, there is still some way to go before the industry can expect to see a commercial product.

It is safe to say that for REC, this is a future product. Although the technology could work, there will need to be further investment and possible changes to existing factories in order to manufacture it.

Seber concluded: "Many of the outstanding questions will be answered by the time the product reaches the end of the internal product development phase. Commercialisation is planned for 2015."

Junior Isles

Do mystical birds hold the key?

My mother could work wonders with chicken for Sunday dinner but there is nothing magical about the near flightless bird – unless you are a voodoo priest using chicken bones to foresee the future.

Nevertheless, it seems that the scraps from Sunday dinner may be the only way of penetrating the veil of mysticism surrounding UK energy bills and the big energy companies.

The cost of living debate and soaring energy prices continue to cast a shadow of distrust over the 'big six', who in some quarters are less popular than bankers. But while energy companies generally acknowledge they have to regain customers' trust, achieving it will be easier said than done.

There appears to be a general apathy among the big six. The latest annual energy company survey of customer satisfaction conducted by consumer group *Which?* revealed that the overall customer score for energy companies serving Great Britain hit a new low of just 41 per cent, down from 49 per cent the previous year.

Speaking at a recent utilites roundtable organised by BT Global Services, Ashleye Gunn, Programme Director, *Which?* said: "They were the lowest of the sectors we surveyed, which included financial services. The average score was 80 per cent.

"There is talk about rebuilding trust but there is not enough action. A year ago, we issued a survey asking suppliers to tell us their cheapest tariff… It was rather depressing that it took three attempts to get the information from British Gas and E.On. It really shouldn't be that hard."

Their indifference is probably partly due to the fact that they operate in a sector where customers currently have few options worth speaking about.

In the recent *Which?* survey, Npower once again topped the complaints list. Paul Clark, CEO of Charter UK, commented: "Figures from *Which?* illustrate that, unfortunately, Npower seems to be struggling to get a handle on its current customer service woes. What will soon become clear, however, is whether this is simply due to temporary setbacks blamed on new systems, or whether there are deep-rooted internal issues preventing the firm from understanding and tackling the sources of the complaints."

Notably, the small guys came out best in the survey, with Green energy supplier Ecotricity and Good Energy coming joint first in terms of consumer satisfaction.

Which? Executive Director, Richard Lloyd said: "Once again the biggest energy companies have been beaten by the smaller suppliers but there are no winners in a broken market that consistently fails consumers."

As of January 1, Ofgem will now force suppliers to introduce standard charges for all energy tariffs as part of its Retail Market Review (RMR). Energy UK, the organisation representing the UK electricity industry, said the new rules will make energy simpler, fairer and clearer. It stated: "The reforms will help customers make better choices by comparing energy tariffs offered by suppliers."

> Some may think it's a bit 'Big Brotherish' but others will think it's really good customer service

Any help in this direction will be most welcome. Gentrack is a developer of specialist software solutions for energy, water and airport utilities, with its headquarters in New Zealand and customers worldwide, including Australasia and the UK.

David Brown, Vice President of Gentrack in the UK commented: "Here you get a water bill twice a year. You get your gas and electricity bill and for the most part with the big six, you've no idea how it's calculated – you may as well throw chicken bones on the floor. I don't have a clue how my bill is calculated. It's all sort of mysticism and actuarial data… Basically, there's no transparency."

In addition to simplifying things for consumers, the new RMR rules also aim to promote the importance of quality of service as a key differentiator between the energy companies.

Ecotricity founder Dale Vince said: "Customer service is a massive part of Ecotricity's focus. People tend to switch energy supplier for three reasons: for a better price, a greener outcome or better customer service."

The first reason was certainly proven following the announcement of UK price rises late last year. According to figures compiled by Electralink, new switching numbers show that around a million customers sought out energy deals in November and December last year. This compares to 3.5 million switches for the whole of 2013.

During its roundtable, BT Global shed some insight on the other two reasons for switching. Research carried out by market research agency Vanson Bourne on behalf of BT shows that different consumers have different requirements from their energy companies.

Jimmy Mortimer, Project Manager for the survey at Vanson Bourne said: "While older customers are more focused on price, younger customers also put a great deal of importance on customer service."

He admits, however, that there is only so much customer service can do unless it is focused on providing a better price.

Rob McGinn, Vice President, Energy and Infrastructure, BT Global Services added: "Of course technology can help with price but in the service sense, bills and tariffs are not as clear as they could be. Customer service should be part of the DNA of any organisation; so fixing billing and tariff issues are all part of the journey."

He added: "But if you look at the younger consumers who are much more focused on aspects of their relationships with utilities that don't involve price, you will see they are also very focused on sustainability. I think they recognise that the only way you can reduce your energy bills in the long term… is to reduce usage of energy. The platforms that energy companies are building, which BT is supporting, allow them to make choices that enable them to use less energy and become more sustainable in partnership with their energy company."

It is a point Brown agrees with. "You can go to the supermarket and see what you are spending. You can see what your deal is on your mobile phone. It's all pretty transparent. You can make intelligent choices on everything else. Yet there's this lump of money going out for gas and electric every month and it's difficult to measure how changing your behaviour or switching to a different tariff might help."

While a few are beginning to look at demand side initiatives, it is a shame energy companies operating in the UK are moving so slowly to embrace the changes that have already occurred in other parts of the world.

Brown said: "Gentrack is an Australian/Kiwi company and the difference is startling. We [in the UK] are probably 5-10 years behind what they are doing down there. I have a friend who, from his phone in London, can look up the consumption of electricity, gas and water of his tenant back home in Wellington.

"In Australia, we can send someone a text asking if they meant to leave the A/C on. It's a tangible reminder that you can do something to reduce energy consumption and cost. Some may think it's a bit 'Big Brotherish' but others will think it's really good customer service. Who does that in the UK?"

Brown talks about people being leaders, followers and dodos. In the UK, the leaders he refers to are the small, newer energy companies like Ovo Energy that make it easier for consumers to do things like read their meters using mobile phones, and essentially help them to feel more in control.

"It's not that they're philanthropic," said Brown, "they have noticed that there's a new business model. People like them will be leaders and there are others that will follow because they see that's where the majority is heading. Then there are the balance that won't change, and they will die."

Brown believes that the big six are more interested in sweating their assets and will not be tomorrow's leaders in customer experience. Big and "cumbersome like dinosaurs" is how he describes them.

Historians tell us the dodo was a big and cumbrous bird. Our limited knowledge of the flightless animal lends it an almost mystical quality. Unable to adapt it soon became extinct. For the incumbent energy companies, the same may not happen overnight – but one does not have to consult the chicken bones to foretell what their future might hold.