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Climate talks gain momentum in run-up to Paris



Determined: French President François Hollande and German Chancellor Angela Merkel



Government leaders, climate negotiators and business leaders seem to be uniting in their effort to reach a strong global agreement at the COP21 climate change summit in Paris later this year. **Junior Isles**

Political and business leaders upped the rhetoric on climate change during several high level international meetings last month, as the world works toward a global climate agreement at the Conference of Parties (COP) 21 summit in Paris in December.

At a meeting in Hamburg, Germany, energy ministers from the Group of Seven (G7) nations said there was unprecedented consensus between them on the urgency of achieving a strong deal in Paris.

Days later at a meeting of 35 countries in Berlin, German Chancellor Angela Merkel and French President François Hollande said in a joint statement that both countries "are firmly decided" to make all efforts to reach "an ambitious, comprehensive and

binding" UN climate agreement by the end of this year in Paris.

International energy ministers also met later at the St Petersburg Climate Dialogue organised by the German government to formalise a negotiating text for the 196-nation COP21 summit.

Notably at the meeting, India's Environment Minister Prakash Javadekar asked rich countries to commit on the present and come up with emission reduction targets for the pre-2020 period in order to have a successful conference in December.

A new global agreement is to be signed for the post-2020 period but experts say commitment to emission reduction in the pre-2020 period is extremely weak under the second

phase of the existing climate treaty, the Kyoto Protocol.

"It will be ironical if we formulate post-2020 architecture without finalising the pre-2020 action plan," said Javadekar.

In May, Canada revealed plans to reduce its greenhouse gas emissions by 30 per cent below 2005 levels by 2030. The news follows announcements in recent months by Europe, the US and Mexico.

Elliot Diringer, executive vice president of the US-based Center for Climate and Energy Solutions, said Canada's target is roughly comparable to the US and the EU targets.

At the end of March, Washington repeated a pledge to reduce emissions by 26 to 28 per cent below 2005

levels by 2025. The EU says it intends to cut emissions by at least 40 per cent below 1990 levels by 2030. Although still preparing its 2030 targets, news reports suggest Japan will likely set an emissions reduction target of 20 per cent below 2013 emission levels by 2030.

Nevertheless, there is still expected to be a shortfall in spite of the expected commitments.

Based on pledges made by China, the EU and the US – who together account for nearly half of global greenhouse gas emissions – COP21 will result in limiting annual pollution to 55-57 Gt of carbon dioxide equivalent by 2030, according to experts.

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Calls for EU ETS to go global as diplomats approve reform

Germany is calling for the European Union's Emissions Trading System (ETS) to become a global scheme. The call comes as EU lawmakers reached a provisional agreement on reforms to boost the flagging scheme.

Angela Merkel, the German Chancellor, recently said: "This instrument would of course be particularly effective if we could introduce it beyond Europe because then we'd have the same general framework around the world... And that would enable us to expand the certificate trading to further areas, even in Europe."

The ETS, the EU's flagship policy designed to limit greenhouse gas emissions (GHGs), covers around 45

per cent of total GHG emissions from the 28 EU countries.

However, a surplus of carbon allowances has depressed the price of CO₂ emissions on the ETS, making it cheaper to use fossil fuels than to switch to clean energy sources.

The EU moved to shore up the scheme last month by approving a proposal to begin reform of the bloc's carbon market for 2019.

Under the proposal, unallocated allowances will be transferred to a Market Stability Reserve (MSR) in 2020 and their future usage will be decided on as part of a broader review of the ETS being carried out by the European Commission, the Latvian

presidency said.

The proposal also prevents the MSR from touching, between 2021 and 2025, any allowances in a 'solidarity fund' for poorer countries, and invites the EC in its upcoming ETS Directive review to consider if up to 50 million allowances should be put in an 'innovation fund' to help industry.

Estimates of the number of unallocated allowances vary from 300 million to around 800 million by 2020.

Analysts say the reform could triple EU allowance prices by the end of the decade while bringing much needed clarity and investor confidence back to the market.

The proposal to introduce a MSR

under ETS from January 1, 2019, was adopted at a meeting of diplomats representing the 28 member countries.

A majority of EU member states approved a final deal on the MSR. Six states – Poland, Romania, Bulgaria, Cyprus, Hungary and Greece – voted against the proposal, according to media reports.

EU environment ministers are due to approve the deal at a meeting in Luxembourg in June and then a session of the European Parliament will consider it in July.

EU diplomats say there should be no major surprises and at parliamentary level, the outline deal was welcomed by the main political groups.

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The projected total, while an improvement on the current trajectory of approximately 70 Gt, is still far higher than the 40-42 Gt level the world needs to reach by 2030 to have a 50 per cent to 75 per cent chance of limiting global warming to 2°C above pre-industrial levels, according to UN estimates.

The business community demonstrated its willingness to help plug the gap at the Business & Climate summit last month in Paris.

A failure to bring enough emission cut commitments to put the world on track for avoiding global warming of more than 2°C is likely to frustrate the majority of businesses, said the Carbon Disclosure Project (CDP). More than 30 companies including Ford Motor Company, Unilever, Nissan and H&M have already pledged to set long-term, science-based climate targets.

Led by the International Chamber of Commerce, leading private sector networks called on governments to recognise a "consultative role" for business while crafting the future climate pact.

Business leaders called on governments to agree on carbon pricing mechanisms, closer collaboration between business and government on climate policies and a joint public-private sector fund for investing in low-carbon technology, especially in developing countries.



Martin: Renault has the technology and is "ready to implement on larger scale"

French companies were out in force at the summit. Car-maker Renault noted that it would be "totally stupid" not to have the right regulations, framework and price signals in place after the UN talks. Claire Martin, Director of sustainable development at Renault said: "We have made the investments and have the technology ready to implement on a larger scale."

Burning of fossil fuels is widely accepted as the major cause of man-made CO₂ emissions and there has been a growing call for subsidies of fossil fuels to be phased out.

The International Monetary Fund (IMF) recently estimated that global subsidies of fossil fuels will reach \$5.3 trillion this year. The estimate takes into account the gap between what businesses and consumers pay for energy and the "true cost" when environmental effects are considered.

The huge sum is mainly due to polluters not paying the costs imposed on governments by the burning of coal, oil and gas. These include the harm caused to local populations by air pollution as well as to people across the globe affected by the floods, droughts and storms being driven by climate change.

Meanwhile, last month Japan confirmed its \$1.5 billion pledge to the UN's climate fund. The commitment brings the current fund total over the 50 per cent threshold to start financing projects in developing countries.

Markets and consumers "reaping benefits" of integration

- Power prices converging in Germany and the Netherlands
- Flow-based market coupling launched

| Junior Isles

A market review prepared by Dutch electricity transmission system operator (TSO) TenneT claims markets and consumers are now truly reaping the benefits of the integration of European electricity markets.

In its recently published Market Review, TenneT examines relevant market developments, including price developments in the European wholesale electricity market in 2014, focusing on the Netherlands and its neighbouring countries: Germany, Belgium and France.

According to TenneT, many of the benefits now being seen in these countries is attributable to the increase in network interconnectors.

The subsea NorNed cable linking the Netherlands and Norway is used almost 100 per cent of the time to import cheaper electricity from Norway. The three interconnectors between the Netherlands and Germany are largely used for electricity imports, while the subsea BritNed cable between the Netherlands and the United Kingdom exports electricity to the UK for most of the time.

TenneT says these developments have contributed to market prices in the Netherlands and Germany gradually converging. Whereas prices were equal in both countries for 19 per cent of the time in 2013, this figure rose to nearly 30 per cent in 2014.

It noted that there was a price decrease in the Dutch market in 2014, attributable to various causes. Average gas prices were lower than in the previous year, three new coal-fired power plants began operation, a number of gas-fired plants were taken out of operation, and cheaper electricity was imported from Norway and Germany on a large scale.

While the Netherlands benefits from this arrangement because it is able to import cheaper (subsidised) electricity via the interconnectors, Germany also benefits because solar energy can be exported to generate more income, said the report.

"Furthermore, this results in a reduction in the lower renewable energy surcharge payable by German consumers. In this way interconnectors contribute to the optimum deployment of renewable energy sources in Europe," said TenneT.

It noted that increased cross-border trading also provides flexibility in the production system by compensating for fluctuating wind and solar.

Commenting on the growing cross-border trade in energy, Gavin Lavelle, CEO at Brady plc, a supplier of commodity and energy trading software said: "As Europe moves towards more renewables, there will be more volatile power prices. Cross-border trading helps to smooth the peaks and troughs. We are seeing a lot more demand for energy trading software that makes it more efficient to trade across national boundaries."

According to TenneT, Dutch electricity consumers benefit to the tune of €80 million per year as the result of greater cross-border trade.

TenneT and many other European TSOs are taking additional steps to increase the efficiency of the European electricity market with the introduction of a market mechanism called Flow-Based Market Coupling. The mechanism is designed to further optimise the deployment of the transmission capacity of cross-border electricity connections.

Late last month the project partners

of the Flow-Based Market Coupling in Central Western Europe (CWE) announced successful launch of the new methodology. The Flow-Based method was approved by National Regulators on 23 April.

By using a more detailed grid description, taking into account the increased energy volatility resulting from the higher renewable production, Flow-Based is a more sophisticated method for capacity calculation. Compared to Available Transmission Capacity (ATC)-based methods, Flow-Based market coupling increases price convergence while ensuring the same security of supply as today.

According to TenneT and its partners this method leads to a more efficient determination of commercial transactions and of resulting physical flows, helping market participants to trade across borders and resulting in electricity prices that better reflect the actual grid situation.

It is expected that CWE Flow-Based Market Coupling will provide a better representation of the actual grid situation and relevant information for proper price formation and, ultimately, investment decisions.

Energy storage gaining traction

Tesla's plan to launch battery storage systems for homes and utilities could have profound effects for the industry, according to some experts.

Last month the US car maker said it plans to launch a battery called "Powerwall" that will be sold by a variety of other companies to the residential market. Tesla hopes to begin shipping a limited number of Powerwall batteries this summer in the US before expanding internationally next year.

Billionaire entrepreneur Elon Musk, Tesla's CEO, said the long-term goal is to reduce the world's reliance on energy generated from fossil fuels while creating regional networks of home batteries that could be controlled as if they were a power plant. This would give utilities another way to ensure that they can provide power at times of peak demand.

Tesla has therefore also announced Powerpack for utilities, a bigger battery system that they can use to manage their grids. Analysts say the utility and commercial markets will

probably be more promising for Tesla during the next few years than residential customers.

Commenting on the news, Professor Mitchell said: "The potential for competitive energy storage, whether household or utility scale, is another nail in the coffin of conventional utilities."

He argued that the long-term implications for energy systems were profound, as decentralised energy systems based on renewable energy and demand management become increasingly attractive with effective energy storage. This in turn undermines the rationale in trying to force through infrastructure for big centralised power plants.

Professor Mitchell said: "The question is no longer whether decentralisation will happen within the energy system, but when the tipping point will be."

"Storage offers the ability to extend both the displacement of fossil fuels and reduction of prices beyond peaks

– making it even worse for companies whose business models are based on fossil fuels and peak pricing profits."

Several businesses, including Amazon.com and Target, plan to use Tesla's battery storage system on a limited basis. Southern California Edison is already using Tesla batteries to store energy.

Enel Green Power and Tesla recently finalised an agreement for the testing of the integration of Tesla's stationary energy storage systems with Enel Green Power's solar and wind plants. The deal aims to increase output from EGP facilities and supply advanced services for a better overall integration of renewables into the grid.

The companies will begin their collaboration with the selection of an initial pilot site, where a Tesla battery system, which has a power output capacity of 1.5 MW and energy storage capacity of 3 MWh, will be installed.

The agreement is part of a wider Memorandum of Understanding between the companies that provides for

both the integration of Tesla energy systems into Enel's business and the development of electric mobility. The agreement is part of Enel Green Power's broader programme for testing stationary storage systems.

Energy storage systems are increasingly being demonstrated by utilities worldwide. At the end of April AES Energy Storage unveiled part of its deployment roadmap for its AES Advancion Energy Storage Solutions, which includes the addition of battery-based storage resources across the US, South America and Europe.

Projects in construction or late stage development are expected to deliver 260 MW of interconnected battery-based energy storage, equivalent to 520 MW of flexible power resource, 25 per cent of which is expected to be on-line by mid-2016. These projects are in addition to the 86 MW of interconnected energy storage, equivalent to 172 MW of resource that the US-based international power plant developer currently has in operation.

Clean energy innovation essential, says IEA

A concerted push for clean-energy innovation is the only way the world can meet its climate goals, according to the International Energy Agency (IEA).

Its recently released flagship energy technology report, *Energy Technology Perspectives 2015* (ETP 2015), shows that despite a few recent success stories, clean-energy progress is falling well short of the levels needed to limit the global increase in temperatures

to no more than 2°C.

It adds that it will be challenging for the world to meet its climate goals solely through the UN negotiation process that is expected to yield an agreement this December in Paris.

That leaves the development and deployment of new, ground-breaking energy technologies as key to mobilising climate action, and the report urges policymakers to step up efforts

to support them.

ETP2015 provides a comprehensive analysis of long-term trends in the energy sector, centred on the technologies and the level of deployment needed for a more environmentally sustainable, secure, and affordable energy system.

The IEA says recent success stories, such as the rapid growth of solar PV and last year's inauguration of the

world's first large-scale power station equipped with carbon capture and sequestration (CCS) technology, indicate there is significant and untapped potential for accelerating research and development in clean technologies.

ETP2015 includes the annual Tracking Clean Energy Progress report, which for the first time looks at progress in energy storage and hydrogen technology.

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Argentina plans for sixth reactor

■ 1200 MW VVER unit under discussion ■ CNNC developing Hualong One proposal

Siân Crampsie

Argentina is making plans for the construction of a sixth nuclear power plant in order to boost electricity generating capacity and meet rising electricity demand.

The government has signed a preliminary agreement with Russian firm Rosatom to establish a framework for cooperation for the construction of a 1200 MW VVER.

Argentine President Cristina Fernandez de Kirchner said that the project would help to improve energy security by reducing the need for fossil fuel

imports. "It's cheap, safe and is not subject to international market and geopolitical fluctuations," Fernandez de Kirchner said.

Rosatom and Nucleoeléctrica Argentina (NASA) also signed a preliminary agreement on construction of the reactor in Argentina that includes provision for Russian state financing at preferential rates.

The two countries will also work together to sell VVER technology in South America and Africa.

Argentina has turned to Russia and China for investment in the energy sector because its uncertain economic

policies are considered too risky by European and US investors. It has outlined plans to invest \$31 billion between 2015 and 2025 on building three nuclear power plants and extending the life of three others to reduce imports of fossil fuels.

China has agreed to build two nuclear reactors in Argentina – an 800 MW pressurised heavy water reactor at the Atucha site and an 1100 MWe plant based on China's Hualong One technology.

The Atucha 3 unit could start construction in 2016 if arrangements over financing are agreed. Argentina needs

China to provide financing for the projects but a recent report in *World Nuclear News* indicated that China will insist that Chinese firms are given priority in all aspects of the project.

Argentina would be against such a clause because it has concerns about delays to the Fuqing project in China, on which the Hualong One technology is based.

The Hualong One project in Argentina could begin construction in 2017 and would cost \$7 billion. Its location has yet to be finalised but China National Nuclear Corporation (CNNC) is in the process of developing a

proposal for NASA covering technical and commercial aspects of the project including pricing and financing.

The two companies are aiming to sign a framework contract for the project by the end of 2015, and a commercial contract and financing agreement a year later.

The Atucha 3 project would cost around \$6 billion and would take eight years to build.

Argentina gets about 50 per cent of its power from natural gas and oil derivatives but domestic production has declined by around 20 per cent in the last decade, leading to a rise in imports.

Deepwater Wind marks milestone

The start of construction work on the USA's first offshore wind farm has been labelled as a "watershed moment" in clean energy development in the country.

Construction of the 30 MW Block Island wind farm started at the end of April, just weeks after Deepwater Wind said that it had fully financed the project.

"The importance of this day cannot be overstated. The Block Island Wind Farm is our Apollo 11 moment," said Emily Norton, Director of the Massachusetts Chapter of the Sierra Club.

The wind farm will comprise five Alstom Haliade 150 6 MW wind turbines installed off Block Island in the state of Rhode Island. Alstom has already completed fabrication in Denmark of all 15 blades for the project,

while Gulf Island Fabrication has started work on the wind farm's five steel jacket foundations.

Bruce Nilles, Senior Campaign Director of Sierra Club's Beyond Coal Campaign, said: "New England has stepped up as a leader in wind energy and shown us that clean, home grown power is real, ready, and reliable."

In March the US Department of Energy (DOE) released a report into the US wind industry indicating that the country could install a total of 86 GW of offshore wind capacity by 2050, alongside some 400 GW onshore capacity.

The Bureau of Ocean Energy Management has designated a wind management area off the coast of Rhode Island and Massachusetts that has the potential to generate as much as 9000 MW of wind power.

Storage firms see US opportunities

Opportunities for energy storage technologies in the USA are growing alongside the country's growing renewable energy sector.

Invenery said last month that it started commercial operation of a 31.5 MW energy storage project in Illinois, USA, and is on track to start up a second project of the same size in West Virginia later this year.

Meanwhile Japan's Sumitomo Corporation announced an investment in Willey Battery Utility (WBU), which operates a battery-based energy storage facility in Ohio.

Separately, NEC Energy Solutions and Amergin Energy announced an agreement to deploy at least 60 MW of integrated battery energy storage capacity within the PJM Interconnection by mid-2016.

Invenery's Grand Ridge energy storage facility is also located within the PJM area and will provide fast-response regulation services to the market. It is located southwest of Chicago, at Invenery's Grand Ridge Energy Centre, home to a 210 MW wind farm, a 20 MW solar project and

another 1.5 MW energy storage unit.

NEC and Amergin hope to start construction of their storage portfolio in 2015. NEC will provide its GSS grid storage solution technology as well as operational support when the network starts operating in 2016.

Increasing amounts of renewable energy capacity – with fluctuating generation levels – mean that it is increasingly important for market operators to employ a means of balancing the grid. Battery storage provides a promising alternative to the thermal and hydropower plants that have traditionally provided regulation services as it can respond quickly and enable fine-tuned adjustment.

According to Sumitomo, WBU's battery storage facility will have a maximum output of 6 MW and will provide regulated services to PJM. It bought the stake in WBU from Renewable Energy Systems Americas and says it wants to expand its presence beyond the PJM frequency regulation market into other regions with high levels of renewable generation such as Texas and California.

Governor Jerry Brown has set a new target of reducing the state's emissions to 40 per cent below 1990 levels by 2030



California sets new bar on climate emissions

California has set a new 2030 target for greenhouse gas emissions, aligning itself with leading international governments ahead of the United Nations Climate Change Conference in Paris later this year.

Governor Jerry Brown has set a new target of reducing the state's emissions to 40 per cent below 1990 levels by 2030, making it the most aggressive benchmark set by a North American government and sealing his reputation as an environmental leader.

The target would mark the halfway point to the goal set by former Governor Arnold Schwarzenegger of emission reductions of 80 per cent over 1990 levels by 2050. It would require accelerated development of renewable energy programmes in the state as well as an increase in electric and zero-emission vehicle use.

California's approach is in marked contrast to several other US states,

which are maintaining pressure on the Obama administration to reverse plans to drastically reduce emissions of greenhouse gases from fossil fuel fired power plants.

Some 15 coal-reliant states are suing the Environmental Protection Agency (EPA) in an attempt to block the proposed Clean Power Plan. They maintain that the plan would cause job losses, hurt the coal mining sector and lead to higher electricity prices.

Other states, including Tennessee, have criticised the plan for not giving credit to nuclear plants for their ability to curb carbon emissions.

US Sen. Lamar Alexander, R-Tenn., recently told a Senate hearing that Tennessee is being unfairly treated in having to make a significant 38.9 per cent cut in carbon emissions under EPA's proposed Clean Power Plan, which doesn't fully recognise the new nuclear reactor being built at the Watts

Bar nuclear plant.

In response, EPA head Gina McCarthy hinted that the treatment of nuclear power projects that are under construction but not completed might be altered in the Clean Power Plan.

■ The US Department of Energy says that a group of carbon capture and storage (CCS) projects it has supported has reached a milestone of 10 million metric tonnes of carbon dioxide (CO₂) captured. The projects contributing to the 10 million tons captured milestone are part of the DOE's Regional Carbon Sequestration Partnership (RCSP) Initiative and the Industrial Carbon Capture and Storage (ICCS) Major Demonstrations programmes. "We are showing that CCS is working now, and that it is indispensable to the DOE's commitment to reduce greenhouse gas emissions and tackle climate change," said Energy Secretary Ernest Moniz.



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China “going out” on nuclear

The proposed IPO of China National Nuclear Corp. and the go-ahead to build the first domestically designed reactor in Fujian province further demonstrate China's intention to become a serious player in international nuclear power plant development, says **Syed Ali**.

China is advancing its ambitions to become a major player in the international nuclear power sector.

Last month China National Nuclear Corp. (CNNC), one of the country's two big state nuclear firms, was given the green light for a domestic initial public offering (IPO) that could raise more than \$2.66 billion.

The decision follows a successful listing in Hong Kong by China's other dominant nuclear power operator, China General Nuclear (CGN) Power Group, which raised \$3.16 billion in an IPO in December.

Money raised from the IPOs will help the companies pursue nuclear new build both at home and abroad.

CGN and CNNC control 90 per cent of China's market for nuclear power. China plans to raise its nuclear capacity to at least 58 GW by 2020 and about 150 GW by 2030, from the current 21 GW. The China Nuclear Energy Association says eight new reactors will start operation this year.

Both companies have slightly different reactor designs but under instruction from the government have been merging their designs since 2011 to produce a common design, known as Hualong-1, to improve the country's chances of winning contracts internationally.

Those efforts reached a major milestone in April, when China's State Council formally approved the first domestically designed Hualong-1 reactor, to be built by CNNC in coastal Fujian Province.

CNNC already has agreements to build six reactors in Pakistan but a framework agreement to build a Hualong-1 reactor in Argentina would be the first overseas example of China's domestic expertise.

“This project will change the environment for our indigenous reactors and will promote the national strategy of ‘going out’ with the nuclear industry,” said Xing Ji, CNNC vice-general manager.

Egypt is believed to be the next priority for China. Two of China's main oil suppliers – Saudi Arabia and Sudan – were also on the list of priorities for Chinese reactor sales in a State Council (cabinet) Energy Development Strategic Action Plan 2014-2020. The plan was distributed in late April at the annual general meeting of the industry lobby group, China Nuclear Energy Association (CNEA).

The document notes that China has nuclear cooperation with 16 countries, but sees particular potential in the Middle East, South Africa and Turkey. European countries on the list include the Czech Republic and Poland.

Although Hualong-1 is supposed to represent a combined design effort by CNNC and CGN, CNNC recently made it clear that the Hualong-1 it is building in Fujian is its own design, better known to the industry as ACP1000.

CGN for its part is marketing a version of Hualong-1 that differs slightly

from CNNC's. CGN hopes to build its Hualong-1 at the Bradwell site on the UK's Essex coast, where it expects to be the controlling shareholder.

“Broadly speaking, they are the same. But there are some differences,” says Xian Chunyu, deputy president of China Nuclear Power Design Co, an institution that reports to CGN.

One of the biggest differences is separate supply chains that are not interchangeable. A foreign utility selecting a Chinese Hualong-1 would still have to choose between CNNC or CGN, despite it appearing to be a single unified design.

There has been speculation in the Chinese media that the country's four big nuclear companies may be merged into a single firm.

“We need a single well-known Chinese nuclear brand which can compete with international brands like Areva and Westinghouse,” stressed Wan Gang, president of the China Institute of Atomic Energy, in a statement.

Funding for Pakistan power sector projects

Pakistan has secured several loans that will help boost its struggling electricity sector.

The Asian Development Bank has approved a \$6 billion loan to help Pakistan's dilapidated power system and other key parts of the infrastructure, Islamabad said.

The loan will support a 660 MW coal-fired power plant at Jamshoro in the southern part of the country. The project will be the first power project based on Thar coal. The funds will also be used for several hydroelectric dams that will each generate between 100 MW and 300 MW.

On May 19th, the ADB said it will provide a \$65 million loan to Mira Power Limited, a special purpose South Korean company, which will build and operate a run-of-the-river hydropower generating facility on Poonch River in Kotli district, around 160 km from Islamabad.

Separately, the National Bank of Pakistan and the Habib Bank offered the Punjab government to underwrite project financing, amounting to Rs84 billion (\$824 million) for its 1200 MW LNG-based power plant at Bhikki in Sheikhpura.

Pakistan faces a power shortfall of around 4000 MW in the peak summer months of June and July.

Pakistan is also exploring its solar potential. On May 5th the country inaugurated its first solar power plant, the latest fruit of increasingly close cooperation with China. The solar park in Punjab province has a capacity of 100 MW.

In late April, Pakistan awarded a \$1.5 billion contract for a 900 MW solar power project in Bahawalpur to Chinese company, Zenergy Company Ltd.

Indonesia needs \$88 billion for power expansion

Energy and Mineral Resources Minister Sudirman Said says that the 35 000 MW programme recently launched by the government will cost Rp 1.1 quadrillion (\$88 billion).

“We need Rp 1.1 quadrillion to finance the programme, so there'll be room for the capital market to contribute financing,” he said during the programme's launch in Bantul, Yogyakarta, on May 4, 2015.

The power generation plan, designed to provide an additional 35 GW by 2019, constitutes one of the major programmes prepared by President Joko “Jokowi” Widodo's administration to help boost economic growth. Based on the government's assessment, growth will be between 5 and 6 per cent in the coming years, and the country will need 7000 MW annually.

A number of projects are already under way. At the start of May Korea Midland Power, one of six power generation subsidiaries of the state-run Korea Electric Power Corp., said it has started construction of a 55 MW hydropower plant on Sumatra Island

that will begin commercial operation in 2017.

In late April state utility company Perusahaan Listrik Negara (PLN) said it would start construction of the 2000 MW Java 7 coal fired station in 2016.

International players are also keen to play a part in developing the sector. Last month Bangka-Belitung Governor Rustam Effendi said he is inviting investors from China to invest in power generation in his province in a bid to avert an electricity crisis.

Following a meeting with seven representatives of China Harbour Engineering Co. Ltd., Rustam said: “... investors have expressed a readiness to build power plants with a combined capacity of 700 MW.”

Meanwhile, investors from the United Kingdom have expressed interest in investing \$4.01 billion in Indonesia's renewable energy sector. The country's Investment Coordinating Board, or BKPM, said in a recent statement: “The investments will be in solar energy, higher than 10 MW, and offshore tidal energy.”



- Agreement on 33 000 GWh by 2020
- Capacity requirement reduced from 8500 MW to 5500 MW

| Syed Ali

After nearly two-years of political debate, the Australian coalition government has agreed on a new Renewable Energy Target (RET). But even though the country has agreed to a lower than hoped for target, some still remain sceptical of whether the agreed 33 000 GWh by 2020 can be achieved.

The RET falls significantly short of the 41 000 GWh that was being campaigned for by experts and some officials, and means that the amount of new large-scale renewable energy to be installed between now and 2020 has been reduced from about 8500 MW to 5500 MW.

The regulator told a Senate inquiry in May that most of the renewable energy to meet that target would come

from wind turbines, and that about 1000 extra turbines would be needed to meet the 33 000 GWh figure.

That represents up to 50 per cent of the existing number of wind turbines, prompting the Liberal National party senator Matt Canavan to ask whether such a large number could be built in time.

Regulator, Chloe Monroe told the Senate it is possible for the target to be reached, based on the known approved projects. However, Canavan remained unconvinced, saying: “I'm deeply sceptical.”

In addition to agreeing to a reduced RET, the government also agreed to remove the review provision under which it proposed to review the RET scheme every two years. Instead of a formal review, the opposing Labor

Party agreed to allow the Clean Energy Regulator to monitor the target with annual statements on progress.

According to a recent Reputex report, Australia requires 47 million tonnes of greenhouse gas abatement per year to meet its 5 per cent emissions reduction target by 2020.

Australia could warm by more than 5°C by 2090, compared with pre-industrial levels, if insufficient efforts are made to cut greenhouse gases emissions.

Estimates released by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Bureau of Meteorology in January found that Australia is on course to have an average annual temperature 1.3°C higher in 2030 than the average recorded between 1986 and 2005.



Germany is keen to make good on its green plans but is meeting stiff opposition from industry over the latest proposals to curb carbon emissions.

| Siân Crampsie

The German government is coming under pressure from utilities and its coal industry to rethink plans to reduce emissions from fossil fuel fired power plants.

It wants to seal the next phase of its energy transition by cutting emissions from the energy sector by 22 million tonnes, a move that would effectively force the closure of power plants but enable Germany to meet its target of reducing greenhouse gas emissions by 40 per cent over 1990 levels by 2020.

The proposals were announced by Sigmar Gabriel, leader of the Social Democrat party, a junior partner in Germany's coalition government, in February. They would, from 2017, give fixed emission limits to older power

plants and force them to pay fines in the form of EUAs (EU emissions allowances) for any carbon dioxide (CO₂) output above those levels.

Environmentalists are urging the government to implement its proposals, but firms such as RWE warn of drastic consequences for business and the economy if they go ahead.

"We would have to shut down two out of our three lignite mines and 17 out of 20 of our lignite-fired power stations," said RWE's chief financial officer Bernhard Günther. Thousands of coal miners and workers in power plants marched against the plans in Berlin in April, warning of job losses.

RWE last month reported a drop in first-quarter earnings of five per cent, from €1.7 billion to €1.6 billion, blaming a "persistent drop" in margins for

conventional electricity generation.

E.ON last month also reported a 15 per cent fall in underlying net income for the first quarter.

The utilities' margins have been squeezed because of a growth in subsidised renewable electricity generation as well as a drop in electricity consumption because of economic conditions. RWE's operating result from conventional power generation dropped 23 per cent from €559 million to €428 million in the first quarter.

Günther said: "As expected the crisis in conventional power generation continues and this leads to shrinking profits there."

In May *Reuters* reported that Germany's economy ministry might bow to the pressure and ease the extent of the levy on coal fired plants.

Reuters reported that it had seen a document indicating that emissions cuts would only total 16 million tonnes by 2020 rather than 22 million. It proposed raising the amount of CO₂ that older plants could emit before penalties kicked in.

The issue presents a real problem for German Chancellor Angela Merkel, who last month pledged an end to fossil fuel power production alongside her French counterpart François Hollande ahead of this year's climate talks in Paris.

"We will strive to decarbonise fully the global economy over the course of this century," the German and French leaders said in a joint statement in Berlin.

However Germany is the world's largest brown coal miner and unions

say that the proposals threaten thousands of jobs. The country also relies on coal for 44 per cent of its electricity and emissions from the electricity sector have been rising over the last three years.

Merkel also called for global greenhouse gas emissions to be cut by at least 60 per cent by 2050 from 2010 levels, and backed a worldwide carbon emissions trading system.

■ UK utility SSE has announced the closure of the 980 MW Ferrybridge C coal-fired power plant in West Yorkshire. Costs at the 48-year old power station "have been rising due to its age and environmental legislation" and the plant is forecast to lose £100 million over the next five years, said SSE. It will close at the end of the current financial year.

European Union investigates state aid

- Capacity markets should be last resort
- Investigation complements Energy Union

Regulators in the European Union have opened an extensive investigation into the way governments in the region are supporting utilities that provide standby capacity to prevent blackouts.

Several EU member states operate capacity markets, where energy companies are paid to hold reserve electricity generating capacity in case electricity demand exceeds supply, but the European Commission is concerned that these may distort competition in the market.

The Commission will carry out a state aid sector inquiry, initially focusing on 11 member states. It will examine their electricity supply and demand

positions to determine whether their capacity mechanisms are required, and whether the incentive payments they make distort competition.

The investigation is one of the first concrete steps that the Commission has taken in its proposed Energy Union strategy, which seeks to harmonise the EU's energy sector in terms of market design. It wants member states to cooperate more and improve market integration and says that capacity mechanisms should only be used as a last resort.

"In some cases it might be more efficient to invest in improving electricity grid connections between EU countries than to build new power stations,"

said Commissioner Margrethe Vestager, in charge of competition policy.

"Governments have a legitimate interest to ensure that there is sufficient electricity supply – households and industry should not face blackouts," added Vestager. "My role is to safeguard that public measures to underpin investment in electricity supplies do not unduly favour particular producers or technologies, or create obstacles to trade across national borders."

"This sector inquiry sends a clear signal to member states to respect EU state aid rules when implementing capacity mechanisms, and contributes to the Commission's goal to build a true Energy Union in Europe."

Offshore sector in Germany booms

Germany is on course to become the largest offshore wind market in the world in 2015.

The country is poised to add 2071 MW of new offshore wind capacity this year, pushing the UK into second place in global rankings.

Data from market analysts GlobalData shows that Germany's offshore wind sector will almost quadruple in size from 2014, when it added 529 MW, and in 2015 will account for around half of the projected global market of 3903 MW.

"Germany's huge increase in offshore installations is attributable to several offshore wind projects scheduled to come online in 2015," said Ankit Mathur, GlobalData's Practice Head for Power.

Key projects coming on line this year in Germany include E.ON's 288 MW Arumbank West project, the 288 MW DanTysk wind farm and the 295 MW Nordsee Ost project.

RWE's Nordsee Ost wind farm was officially inaugurated in May. The wind farm features 48 Senvion 6 MW wind turbines. Arumbank West and DanTysk both use Siemens 3.6 MW machines.

Progress is also being made in offshore grid connections in the North Sea.

In April Prysmian and Siemens announced that the 864 MW SylWin 1 offshore grid connection had been successfully commissioned and handed over to TenneT, the Dutch-German grid operator.

"2015 is a special milestone year for

TenneT," said Lex Hartman, member of the managing board of TenneT TSO GmbH. "We will be completing further offshore grid connections by the end of the year, meaning that all in all we will have implemented a capacity of more than 5000 MW, or more than two-thirds of the offshore expansion goal set by the Federal German government by then."

Three offshore wind farms – DanTysk, Butendiek and Sandbank – are connected to SylWin 1. All of these farms are equipped with Siemens 3.6 MW wind turbines.

According to GlobalData, the UK market will remain steady, decreasing marginally from 813 MW in 2014 to 801 MW in 2015. Furthermore, the UK will slip down to third place in the rankings, as China surges into second position with 817 MW in 2015.

"Additionally, the next few years will see China maintain its annual offshore wind installations around the 1 GW mark, while the UK will observe relatively lower installations until 2018, when the country's next offshore growth spurt is expected," said Mathur.

GlobalData's report also states that last year saw order intake for offshore wind turbines rise at a blockbuster Compound Annual Growth Rate of 367 per cent, from 288 MW in 2013 to 1346 MW in 2014.

In terms of company share, Siemens remained the market leader in 2014 with an offshore order intake of 690 MW, followed by Areva with 350 MW.

Solar plants win support in Turkey

Turkey is turning increasingly to renewable energy resources to improve energy security and reduce imports.

The economy ministry is to award feed-in tariff (FIT) licenses to 28 large solar photovoltaic (PV) plants, three wind power projects, one geothermal plant, one hydropower plant and a coal-fired plant this year.

The FIT incentive programme is designed to encourage the development of domestic and renewable energy resources. The 35 projects awarded licences in 2015 will add 471 MW to the country's grid.

In February, the European Bank for Reconstruction and Development (EBRD) said it had helped Turkey draw an action plan to deploy about 61 GW of renewable energy capacity by 2023, including 20 GW of wind, 1 GW of geothermal and 5 GW of solar.

Turkey's incentive programme is making it a target for international renewable energy investors.

In April, USA-based New Generation Power International (NGPI) announced a joint venture with Yilsan Holding, Mineks International and DCM Energy to develop, own and operate a 100 MW geothermal energy project in Turkey.

"NGPI's goal is to be a leader in global renewable energy generation, and Turkey is one of several countries of importance to us," said Dr. Chirinjeev Kathuria, founder and chairman of NGPI. "There is huge potential to leverage Turkey's natural resources to fuel the country's growth and provide electricity to its people for the next 20 years."

The project will be built in the North-west region of Turkey, and will be constructed in three phases. The initial 10 MW will be completed by the end of 2015, while an additional 40 MW will be operational by the end of 2016. The remaining 50 MW will be operational by the end of 2017.

South Africa mulls Eskom sale

■ 30 per cent stake considered ■ Eskom requests tariff increase

| Siân Crampsie

The South African government is considering the privatisation of Eskom in order to help the country overcome its ongoing power crisis.

The state-owned utility is implementing regular load shedding events and with little relief in sight, the government has started to explore options for the sale of a stake in the firm.

The sale could involve a strategic investor or an initial public offering, according to reports, and could also see the sale of non-core assets as well as power stations.

The move would provide a platform for investment in the beleaguered power sector, which is currently holding back economic growth

in South Africa.

Eskom also announced last month that it and its suspended CEO, Tshepo Matona, had mutually agreed to part ways.

Nhlanhla Nene, the finance minister, told reporters that a policy decision on the sale of a 30 per cent stake in Eskom had been made and that the treasury would explore how to structure a potential deal.

"The most pressing risk facing us at the moment is energy generation—and Eskom in particular. We are concerned about the negative impact the electricity constraint is having on our growth," Nene said. "Ensuring that Eskom returns to full financial and operational stability is our top priority as government."

Any privatisation deal is likely to meet strong opposition from South Africa's labour unions, who have already raised concerns about the impact of a sale on jobs and rural electrification.

"We don't support the privatisation of Eskom. It is a strategic company that has a key mandate to electrify the country. We don't believe it should be in the hands of the private market," said Castro Ngobese, a spokesperson for the National Union of Metalworkers, which represents many workers at the utility. The National Union of Mineworkers, which also has members at Eskom, said in a statement "any intention whatsoever to sell Eskom or part of Eskom will be resisted. Eskom is not for sale."

Eskom has an estimated \$17 billion funding gap to 2018. Investment is needed in new power generating and grid capacity, as well as in its maintenance programme which fell behind schedule as the firm kept units open to keep the lights on. In May Eskom asked the energy regulator NERSA for permission to raise electricity prices and said that it faced "several operational and financial challenges which make the task of meeting electricity demands more difficult resulting in... regular emergencies being declared".

The energy regulator said it would hold public consultations on Eskom's application and a decision will be made by end of June, with any price increases likely to come into effect by September.



Green strategy unveiled for Dubai

Dubai is to strengthen its shift to a green economy with a new strategy launched by the Dubai Green Economy Partnership (GEP).

The new strategy will support research projects and partnerships that help companies adopt green technologies in their businesses. It will establish a green innovation centre, promote green trade and investment in regional markets and accelerate the adoption of green technologies, products and services.

"The green economy is the largest sector in the world together with the IT sector in advancing innovation. Dubai Green Economy Partnership is pioneering a comprehensive strategy that links green economy and clean technologies while also promoting green trade and investments in Dubai," said Fahad Al Gergawi, CEO of Dubai Investment Development Agency (Dubai FDI), and Secretary General of Dubai GEP.

The new strategy came weeks after another green initiative, Dubai Carbon, signed an agreement with London-listed AFC Energy aiming to install the largest single deployment of fuel cells to power the ambitious emirate's infrastructure plans.

Dubai Carbon and AFC will assess the potential for an estimated 300 MW of hydrogen fuel cell generation capacity in Dubai by 2020, at an

estimated cost of about \$1 billion.

AFC is looking at two sites for its fuel cell technology that it hopes will be finalised in the next three months and "several others" by the end of the year.

Some developments being studied include the Dubai Expo 2020 site, the Al Maktoum International airport complex, and man-made islands off the emirate's coast.

The partnership between Dubai Carbon and AFC will assess the cost implications, and outline fuel cells for equity and debt financing with Dubai-based green funds.

"We need to define the projects to dictate the financing, but a number of private and public parties are looking at financing," said Adam Bond, AFC's Chief Executive. "We are in conversation with them and will finalise that over the coming months."



New trade dispute looms in Europe's solar sector

■ EPIA alters stance on trade
■ Chinese firms violating tariff arrangements, says EU Pro Sun

Duties on solar products imported to the EU from countries such as Malaysia and Taiwan could be applied after a new action was launched by a European lobby group.

EU Pro Sun says that Chinese companies are circumventing anti-dumping and anti-subsidy duties by shipping goods to the EU via third countries and has formally asked the European Commission to investigate.

EU measures against dumped and subsidised imports from China have been in place since December 2013 and are due to expire at the end of 2015, although this deadline could be extended by the European Commission.

The European Photovoltaic Industry Association (EPIA) recently called for "free and fair trade" between Europe and China and for duties to be removed. It believes that European duties on Chinese solar products are a

likely factor in the slowdown in growth of installations in Europe.

"EPIA is a strong supporter of free and fair trade and we would like to see trade relations between Europe and China, on solar modules and cells, return to normal undistorted, fair trade as soon as possible, when the duties and respective price undertaking expire in 2015," said EPIA President Oliver Schaefer.

EPIA estimates that employment in the solar sector comprised about 265 000 full time jobs in 2011. More than half of these are now gone according to IEA estimates, the majority of them in the installation sector, which is labour intensive.

"We support all actions that can contribute to increased solar job creation in Europe along the solar value chain," said Schaefer. "We believe that taking this position on the trade case supports

this objective."

EU Pro Sun, which was formed in 2012 to lobby for an investigation into trade practices of Chinese solar firms in Europe, has submitted import-export statistics to the Commission including concrete examples of circumvention. Its President, Milan Nitzschke, said that there has been a "massive increase of shipments from China to Taiwan and Malaysia and further to Europe".

He added: "Up to 30 per cent of Chinese solar imports bypass EU import measures through fraudulent circumvention. European industry has already been devastated by illegal Chinese practices, and the EU and European governments have lost substantial tax revenues at a time of great need."

The European Commission was due to decide by the end of May whether to carry out a formal investigation, which could take nine months.

Companies News

EDF makes offer for Areva NP

EDF has stepped in to shore up beleaguered French nuclear reactor firm Areva.

The French state-owned utility has made an indicative offer for Areva's reactor unit as part of a move by the French government to reorganise the country's nuclear sector.

The offer is thought to be worth just over €2 billion, according to a report in *Les Echos* newspaper, and would provide Areva's business with a much needed cash boost.

The French government, which

owns more than 85 per cent of both firms, could make a decision on the offer this summer after a firm bid is made. Other companies, including Engie, have expressed an interest in buying some of Areva's assets.

Areva has posted losses for four consecutive years and has announced plans to unveil a new strategic plan before reporting its first-half results at the end of July.

It reported a net loss of €4.8 billion in 2014 and said its first-quarter revenues for 2015 declined by 1.1 per

cent to €1.76 billion.

In March Areva announced plans to cut costs across its business and reduce capital expenditure. It will reduce its global workforce by 5000-6000 over three years, with most losses in France.

The proposal from EDF will result in the break-up of Areva and could be accompanied by a capital injection from the state into the nuclear firm.

Other options thought to have been discussed by EDF, Areva and the government include the sale of Areva's

engineering business to EDF.

This option would require a greater capital injection by the state, however, to keep Areva afloat.

"It is the state, as the controlling shareholder of both companies, that must decide on the matter, and it has said it would do so before the summer," said Philippe Varin, Areva chairman and EDF board member, on the sidelines of EDF's annual shareholders meeting last month.

He added that the solution would have to make industrial sense in order

for Areva to remain a serious player in the global nuclear business.

Areva has lost ground to rivals from Russia, China and South Korea in recent years and has also suffered because of a contraction in the new reactor business in the wake of the Fukushima disaster.

Its reputation has also suffered because of problems at two EPR projects in France and Finland that resulted in cost overruns and delays.

Areva has not sold a new nuclear reactor since 2007.

Yingli struggles under debt

Troubled Chinese solar panel maker Yingli is seeking investors to remain solvent.

The firm said last month that its debts and financial position could adversely affect its business and its ability to meet payment obligations. It told investors that it was taking measures to shore up its businesses.

Shares in Yingli fell 45 per cent after the warning was issued, before recovering by 20 per cent later in the week. The firm is the world's second-largest solar panel manufacturer.

Yingli said in a statement that it "has already taken a series of positive and substantive actions and steps relating

to its debt repayment plans, including the recent repayment of mid-term notes in the principal amount of RMB 1.2 billion (\$193.5 million), which matured on May 3, 2015". It also said it was "optimistic about and confident in its ability to continue servicing the global solar market" and that it is well-positioned to access capital in order to take advantage of the current surge in solar demand.

Liansheng Miao, chairman and chief executive officer of Yingli Green Energy, commented: "While we still have another series of medium term notes in the principal amount of RMB 1.0 billion due on October 13, 2015, we believe that we will meet our repayment obligations based on the substantial progress we have achieved to date to secure funds to repay these notes on schedule."

Bloomberg reported that United Photovoltaics Group (UPV), a Chinese state-owned partner of Yingli, could help the firm recover its financial position either on its own or in partnership with other Chinese solar companies.

Yingli has suffered from a slump in solar panel prices that resulted from an overcapacity in manufacturing in China. Its strategy of focusing on the Chinese market has not helped its situation, according to analysts.



Siân Crampsie

Atlantis Resources Limited says it will become a world leader in tidal current power technology after acquiring Marine Current Turbines (MCT) from Siemens.

The firm has signed a deal to buy the entire issued share capital of UK-based MCT from Siemens in return for a 9.99 per cent stake in its business.

The move will create one of the largest portfolios of tidal current power projects in the UK, expanding Atlantis' footprint into Wales, Northern Ireland and southern England, and will also give Atlantis access to an additional potential project development portfolio of 200 MW.

MCT's technology includes the SeaGen S, the world's first utility-scale

electricity generating tidal stream unit, which has been operating off the coast of Northern Ireland for over five years, and its next-generation 1 MW-scale SeaGen U and F units.

Its current project portfolio includes developments at Kyle Rhea, where it identified a potential for an array of up to 8 MW off the coast of Skye, Scotland, and Anglesey Skerries off the coast of North Wales, where up to five SeaGen S devices could be installed.

"Marine Current Turbines has developed a world leading tidal turbine, a world class engineering team, unrivalled expertise in long-term turbine operations and testing through its SeaGen installation at Strangford Lough and an impressive portfolio of projects under development across the UK," said Tim Cornelius, CEO of Atlantis.

Atlantis believes that MCT's SeaGen system will complement its own AR1500 1.5 MW tidal turbine, which it is planning to install in the first phase of the MeyGen project in the Pentland Firth off Scotland's northern coast. It says it will assess MCT's portfolio to prioritise projects to pursue in the near term and identify projects to defer or "potentially divest".

Atlantis Resources was the first tidal developer to float on AIM, London's alternative investment market, and recently announced the start of construction of MeyGen, which will be the world's largest tidal stream project when fully developed.

The first 6 MW phase of the project is on track to start producing electricity in 2016. The total potential of the site is just under 400 MW.

GE aims to close Alstom deal

GE is willing to offer concessions to the European Commission to reach a conclusion on the biggest deal in its history.

Siân Crampsie

GE remains optimistic of sealing a takeover of Alstom's power and grid business by mid-2015 in spite of the European Commission's concerns about the impact of the deal.

GE's CEO Jeffrey Immelt last month met with Margrethe Vestager, the EU's new anti-trust chief, and said it would be prepared to offer concessions to the European Commission to secure approval for the proposed

€12.4 billion deal (\$13.6 billion).

GE has not specified what concessions it would be prepared to offer, but said it would come up with detailed proposals within a month.

Such concessions could include disposals but would "preserve the economic and strategic rationale of the deal", GE said.

The proposed takeover is part of a radical transformation of GE planned by Immelt, which includes the group shedding most of its financial services

operations to focus on its industrial businesses. It would be the largest acquisition in the firm's history.

The European Commission in February launched an investigation into the proposed takeover because of potential competition concerns in the market for heavy-duty gas turbines in Europe.

GE has so far tried to ease the Commission's concerns by pointing out that the EU market for heavy-duty gas turbines is almost non-existent because

of a slump in electricity demand and a rise in renewable energy.

However *Reuters* has reported that the Commission is unlikely to approve the GE-Alstom deal without concessions from GE, citing people familiar with the matter.

The Commission's apparent stance, and the uncertainty surrounding the deal appear to have spurred GE into considering concessions.

GE and Alstom believe that the time taken to conclude the deal has

had a detrimental effect on Alstom's business.

The French company has reported that orders for the energy businesses that it plans to sell to GE were down 12 per cent for the year to March 31 2015, at €13.3 billion.

In a presentation to investors this month, Alstom highlighted "low order intake in thermal [gas and coal] power" generation equipment and a "sales decrease reflecting slower order intake in recent quarters".

10 | Tenders, Bids & Contracts

Americas

Grande Prairie orders Vestas wind turbines

BHE Renewables LLC has placed an order with Vestas for 200 wind turbines for the 400 MW Grande Prairie wind farm in Nebraska, USA.

Vestas will provide its V110-2.0 MW wind turbines for the project, which will be the largest wind project in Nebraska when completed at the end of 2016.

Vestas' scope includes supply, commissioning and a five-year service agreement.

Virginia Electric orders MHI J gas turbines

Mitsubishi Hitachi Power Systems Americas, Inc. (MHPSA) has received an order from Virginia Electric and Power Company (VEPCO) for the supply of three M501J gas turbines to be installed at VEPCO's Greensville County power station.

The new gas turbine combined cycle (GTCC) power plant will combine the output of the three M501J gas turbines with a steam turbine resulting in the largest new construction GTCC block in North America. Utilising low cost natural gas, the plant will produce approximately 1600 MW.

This order is the third MHPSA advanced design gas turbine order placed by VEPCO over the last five years. The other two sites, Warren County and Brunswick County power stations, utilise three M501GAC gas turbines. Warren County has already achieved commercial operation and Brunswick County will follow in 2016.

All three sites are covered by an MHPSA long term maintenance agreement to provide parts, repairs and maintenance services plus remote monitoring of vital operating data.

Abengoa, Enel selected for Oaxaca plant

Mexico's Pemex has selected Abengoa and Enel to jointly develop a 517 MW cogeneration power plant at the Antonio Dovalí Jaime refinery near Salina Cruz, in Mexico's Oaxaca state.

The new plant will supply Pemex with electricity and steam, with the excess power being sold in the market. Abengoa estimates the project investment to be approximately \$950 million.

Siemens equips Amazon wind farm

Siemens is to supply 65 wind turbines and 67 transformers to a wind farm that will power an Amazon web services data centre in the US.

The Fowler Ridge wind farm in the state of Indiana will have a capacity of 150 MW and will be equipped with Siemens' SWT-2.3-108 wind turbines. Installation is scheduled to begin in July, with commissioning planned for the first quarter of 2016.

Siemens will also be providing long-term service for the wind turbines.

Asia-Pacific

Gamesa wins 100 MW supply deal

Gamesa has signed a new contract in China for the supply of 100 MW of wind turbine capacity to Hebei Construction & Investment Group (HICIG).

Gamesa will supply, install and commission 50 of its G97-2.0

turbines at the Fengdianzhiqing wind farm, located in Zhangjiakou, in the province of Hebei. These 50 turbines are due for delivery during the third quarter of 2015, while the wind farm is slated for commissioning the following quarter.

Gujarat plants set for retrofit

Alstom and NASL have been awarded a contract worth approximately €26.6 million by the Gujarat State Electricity Corporation Ltd (GSECL) to renovate and modernise two steam turbines at the Ukai and Wanakbori thermal power stations in India.

Alstom will perform full shaftline retrofits of the 200 MW BHEL-supplied LMZ design steam turbines at unit 4 of the 1350 MW Ukai power station and unit 3 of the 1470 MW Wanakbori power station. The retrofits will increase turbine efficiency by around 14 per cent from existing operating conditions, reducing coal consumption and emissions.

The scope of each project includes engineering, supply, erection, commissioning and testing. The projects are scheduled to be commissioned in 2017.

Vestas wins in Australia

Vestas Wind Systems A/S has received a 19.8 MW order for six of its V117-3.3MW turbines for the Coonooer Bridge wind farm in Australia.

The order was placed by Coonooer Bridge Wind Farm Pty. Ltd., which is owned by Eurus Energy, Windlab, and local community shareholders. The order includes a full engineering, procurement and construction (EPC) contract as well as a long term service agreement.

Located in the state of Victoria, the Coonooer Bridge Wind Farm is one of only three successful projects under the Australian Capital Territory (ACT) government wind auction process awarded earlier this year, and the first to achieve financial close.

Coonooer Bridge Wind Farm is scheduled for completion in March 2016.

ReNew Power chooses Suzlon

ReNew Power, one of India's largest independent power producers, has placed an order with Suzlon Group for a 90 MW wind farm project in Madhya Pradesh state.

Suzlon will supply its revolutionary S97 120 m hybrid tower wind turbine generators with a rated capacity of 2.1 MW. The project is scheduled for commissioning in March 2016.

The S97 120 m is world's tallest hybrid tower designed to harness the wind energy across low wind sites. It is a combination of lattice and tubular structure, which ensures higher yield and potential increase in power output by 12-14 per cent compared with other designs.

Alstom selected for India smart grid pilot

Himachal Pradesh State Electricity Board Limited (HPSEBL) has selected Alstom T&D India to lead a smart grid pilot project.

The project is the second of 14 smart grid projects under the Indian Ministry of Power's flagship smart grid pilot programme.

It will act as a proof-of-concept to further strengthen the information technology system in place, to make the distribution grid cost-effective, more responsive and better engineered for reliability and self-healing operations.

Alstom will design, develop and implement an integrated set of smart grid applications targeting power quality issues, managing peak demand, power outages and limiting violations at distribution network nodes at the Kala Amb industrial area of Himachal Pradesh. Its solution will be based on its e-terradistribution 3.0 – a fully Integrated Distribution Management System (IDMS).

Europe

Capstone expands in Europe

Capstone Turbine Corporation has received an order for a C1000 micro-turbine to upgrade an existing solid waste treatment centre in Tampere, Finland.

Fuelled by landfill biogas collected from two stations on-site, the C1000 micro-turbine will be installed in a combined heat and power (CHP) application along with a 1400 kW exhaust heat exchanger, booster, and automation and gas treatment systems. The innovative energy system will convert organic solid waste into clean, renewable energy for the waste treatment facility.

In addition, the exhaust from the micro-turbine will be captured to provide thermal heat at the highest efficiency possible.

Alstom signs contract for Tilbury

Alstom has signed a contract with Burmeister & Wain Scandinavian Contractor (BWSC), the Danish power plant specialist, for a geared reaction steam turbine (GRT) at the proposed Tilbury biomass project in the UK.

The 45 MW waste wood power station will be located on the River Thames near London and will be built by BWSC and Aalborg Energie Technik (AET). This contract follows two others that Alstom signed with BWSC for 23 MW and 50 MW turbines for schemes in Widnes and Snetterton, UK, earlier this year.

The Tilbury plant is expected to generate 300 GWh of green electricity every year when it is commissioned in July 2017. It will burn around 285 000 tonnes of waste wood a year.

CG supplies offshore substation

Avantha Group Company CG, along with other consortium partners Cofely Fabricom and Lemants, has been awarded the contract for the turnkey supply and installation of HV offshore substation for the 400 MW Veja Mate Offshore Project GmbH.

The scope of work for CG includes the electrical engineering, grid compliance studies, HV/MV equipment supply, installation and commissioning. The equipment will be installed at the 400 MW offshore substation for the Veja Mate wind farm located over 100 km off the German coast in the North Sea.

The project will be brought online before the end of 2017.

This project adds to the growing list of 12 offshore substations utilising CG high voltage AC solutions, with a total offshore wind generation capacity of nearly 3500 MW. The accumulated contract value on these offshore wind high voltage transmission scope projects, including Veja Mate, represents about €200 million (\$22.5 million).

Westinghouse inspects Leibstadt

Westinghouse Electric Co and its subsidiary, WesDyne International, have been awarded a long term contract for reactor pressure vessel nozzle

inspection at Leibstadt Nuclear Power Plant (KKL) in Switzerland.

The six-year contract includes an option for four additional years, and its scope includes qualification of the KKL mechanised ultrasonic inspection system using a state-of-the-art phased array technique and yearly inspections of eight different nozzle types – 56 total – with each nozzle having up to three welds. A total of 127 welds will be inspected over the project's duration.

This contract will be executed primarily out of Westinghouse's facility in Mannheim and supported by an international team of experts from WesDyne, which specialises in non-destructive inspection.

Amec FW awarded robotics contract

Amec Foster Wheeler has been awarded a seven-year contract by Fusion For Energy (F4E) for the development and delivery of the Neutral Beam Cell Remote Handling System on the ITER fusion reactor at Cadarache in the South of France.

The framework contract, worth up to €70 million (\$78 million), is the largest nuclear robotics contract so far awarded by F4E to a UK company. Amec Foster Wheeler will lead the project as prime contractor with specialist sub-contractors CCFE (Culham Centre for Fusion) the UK's Fusion National Laboratory, Reel SAS of France, Walischmiller Engineering GmbH of Germany, Hyde Group of UK, Capula of UK, VTT the Technical Research Centre of Finland, TUT (Tampere University of Technology), Finland and KU Leuven - MAGyICs of Belgium.

ITER is a multi-billion pound project that aims to demonstrate the technical feasibility of nuclear fusion as a future power source.

International

Jordan selects solar bidders

Twenty-four companies have been qualified by the government of Jordan to submit bids for the construction of four solar farms in the country.

The companies are required to submit their financial offers to the Minister of Energy and Mineral Resources, which will select winning bidders, according to the *Jordan Times*. They include Scatec Solar, Seci Energia, Neoen, Linuo Group, SunEdison Italia Construction and Alten Renewable Energy Developments.

The four solar farms will each have a capacity of 50 MW and form part of Jordan's plans to improve energy security by boosting renewable energy capacity to ten per cent of the energy mix by 2020.

RAECO orders Wärtsilä plants

Wärtsilä Corporation has received orders to supply two smart power generation power plants for Rural Areas Electricity Company, or RAECO, in Oman.

The power plants, with a combined capacity of 104 MW, will supply electricity to rural areas in southeastern Oman, outside the national grid. The power stations will operate in extreme conditions of up to 52°C.

The larger of the two power plants will be located on the island of Masirah on Oman's eastern coast. It will consist of seven Wärtsilä 32 engines and have an output of 56 MW. The second plant, located in Saih Al Khairat, will have six Wärtsilä 32 engines with a total output of 48 MW.



Oil

Big oil producers continue to focus on market share

- Iran set to increase production
- Saudi Arabia production up to 2005 levels

David Gregory

The chance that a final agreement on Iran's nuclear research programme could be reached by the end of June means that some sanctions against Tehran could be lifted in the near future. Iran is counting on sanctions that bar the purchase of its crude oil to be lifted soon.

Iran is already planning to return to the market in a big way, vowing to restore its own market share, which has been lost during the course of sanctions and the collapse of oil prices over the course of the last year. Reports say that Iran has as much as 30 million barrels in floating storage that could easily be made available.

Despite the prospect that a rush of Iranian crude onto the market could result in a further decline in oil prices, Iran remains adamant by maintaining high crude output in defence of its own market share.

Sanctions imposed by the US and the EU in 2012 resulted in Iranian

crude exports falling from around 2.3 million b/d to 1 million b/d, which was shipped to countries that were excused from the consequences of breaking the sanctions. Current crude oil production is estimated at around 2.8 million b/d.

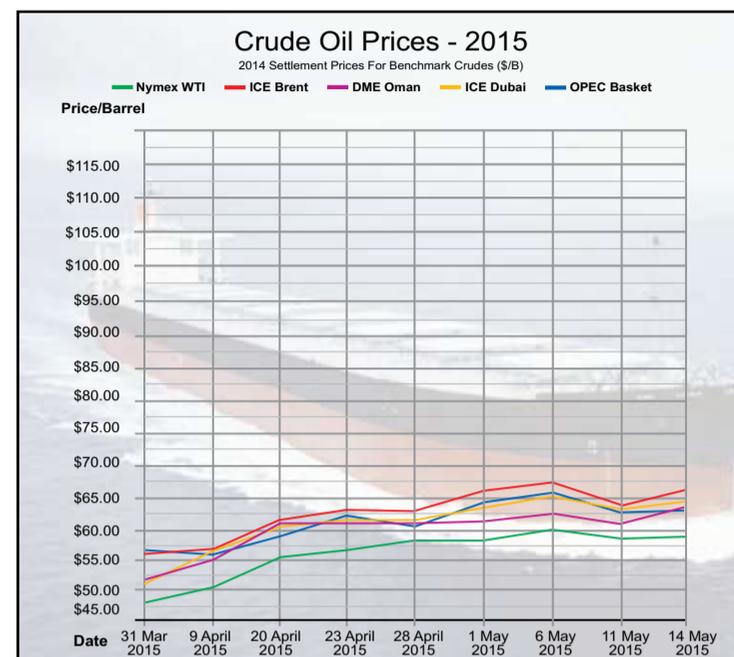
"Iran will start to increase its production within 10 days," Iranian Oil Minister Bijan Zanganeh stated in early May during an energy conference in Tehran. "In six months we will reach 3.8 million b/d and by the end of the current Iranian year [March 2016], we will produce 4 million b/d."

Zanganeh insisted that Opec "will arrange its production not to make it difficult for the market". According to the minister, Iran lost more than 60 per cent of its market share and said: "No condition or pressure would prevent Iran from retaking its lost production share in the global market. It is important for us to preserve our share in the market." Zanganeh said Iran would concentrate on marketing its oil in Southeast Asia, adding that once

sanctions are removed Iran would establish a new marketing strategy to secure the market for its oil.

The Iranian oil minister has also called for Opec to cut its production by 5 per cent to allow for the return of Iranian oil and also to reduce the glut of crude oil, but that is unlikely to be the outcome of the June 5 meeting in Vienna of Opec members. Saudi Arabia is expected to continue with its policy of refusing to cut production unless other oil producers – both Opec and non-Opec – reduce output as well.

There is an estimated 2 million b/d more oil available than the market demands. According to Opec's *Monthly Oil Market Report* for May, the group produced (based on direct communication from members) 31.487 million b/d in March, exceeding its own production target of 30 million b/d by nearly 1.5 million b/d. Saudi Arabia produced 10.308 million b/d in April, according to the report, while production (based on estimates made by secondary sources) for Iraq amounted to



3.67 million b/d in April, and 468 000 b/d for Libya, which has the capacity to produce around 1.5 million b/d.

Should fighting in Libya cease it could possibly put another 1 million b/d on the market, which would likely put further downward pressure on oil prices.

According to figures released by the Riyadh-based Joint Organizations Data Initiative (JODI) in mid-May, Saudi Arabia's exports increased during March to 7.898 million b/d, a sign of growing demand for oil. This figure compared with 7.35 million b/d in exports in February. Saudi Arabia last exported that much crude in November 2005, when it shipped 7.962 million b/d.

While Saudi Arabia denies targeting any competing oil producer with its production policy, Riyadh is seen

as taking these steps in order to force the producers of high cost oil – particularly shale oil producers in the US, deep offshore crude and heavy oils – out of the market. The country claims its strategy is working, and the number of working shale rigs in the US is reported by the International Energy Agency (IEA) as having fallen by 60 per cent.

But that is not expected to become a permanent situation. The shale boom in the US is not going away. Analysts differ on its future, but a number of them say that shale oil producers will resume pumping as soon as the price rises to the point where it again becomes profitable. In this regard, shale oil output will likely fluctuate until a price range is established that might allow oil producers to establish a firm market share, but then, maybe not.

Gas

Turkmenistan keen on Europe but wary of making the leap

The EU is again attempting to persuade Turkmenistan to commit gas to European markets but Ashgabat is wary of Moscow's reaction if it commits to the Trans Caspian Gas Pipeline.

Mark Goetz

The European Union has again turned its attention to Turkmenistan as a source of natural gas supply, but while ever keen to make its huge gas reserves available to Europe, Ashgabat remains coy about taking the leap that would send its gas westward.

During a recent energy conference in Turkmenistan, it was announced that a new, potential giant gas field has been discovered in the country's southeast, south of the giant Galkynysh gas field, which is estimated to contain a resource of up to 21 trillion cubic metres (tcm) of gas.

Turkmenistan has the fourth-largest natural gas reserves in the world and the recent discovery of the Garakul, where the gas resource is initially estimated at 14 trillion cubic feet (396 billion cubic metres) will reinforce that ranking.

In an effort to reduce its dependence on Russia for gas supplies and concerned over Moscow's plans to halt all gas shipments through Ukraine

and shift those shipments to the planned Turkish Stream gas pipeline across the Black Sea, the EU is again attempting to persuade Turkmenistan to commit to European markets.

It's tricky. Turkmenistan was once a big exporter of gas to Russia, and to Ukraine, but gas sales to those countries have dried up, primarily for political reasons. Over the last few years, Ashgabat has made a number of sales and purchase agreements with China, which will at some point receive up to 60 bcm/year from Turkmenistan via the new Trans-Asian Gas Pipeline. That 1800 km pipeline originates in eastern Turkmenistan and passes through Uzbekistan and Kazakhstan before reaching the Chinese border.

Ashgabat is also engaged in planning the Turkmenistan-Afghanistan-Pakistan-India (TAPI) gas pipeline, which is a good idea that has been discussed for well over a decade. The lack of security in the region, particularly in Afghanistan, has held this project back as well as the lack of commitment from its partners.

Since the late 1990s, the possibility of building a subsea gas pipeline across the Caspian Sea has been on the agenda, but disputes between Turkmenistan and Azerbaijan over their offshore territory, Ashgabat's continual balking despite repeatedly stating its interest in shipping gas to Europe, and the unresolved political status of the Caspian have held the project back.

In particular, Russia and Iran are opposed to the Trans Caspian Gas Pipeline (TCGP) project, citing endangerment to the environment. In truth, Russia is unwilling to provide any opportunities to possible competitors to the European market, and Iran, too, sees Europe as a future destination for its gas.

The pipeline would run about 300 km from Turkmenistan to Azerbaijan and reach depths of 300 m. Current offshore operations in the Caspian Sea have resulted in laying hundreds of kilometres of oil and gas pipelines between platforms and the shore.

While its relations with Russia are

not particularly close, Ashgabat must maintain cordial ties and is wary of Moscow's reaction if it does commit to the TCGP.

Russia, meanwhile, is keen to establish its Turkish Stream pipeline before the EU can arrange a deal with Turkmenistan. Last December it canceled the planned South Stream pipeline across the Black Sea because the EU insisted that the pipeline comply with its third party access rules. Russia would not accept the EU rules and decided to cancel the project and instead route the pipeline to Turkey, from where EU customers will be expected to take delivery of their contracted volumes.

Another reason for the EU's new talks with Turkmenistan is the fact that the pieces of the Southern Gas Corridor are falling into place. This project will boost EU energy security by providing a new source of gas. Azerbaijan's Shah Deniz gas is due to arrive in Europe in 2019 via the Southern Gas Corridor. The project is comprised of an expanded South

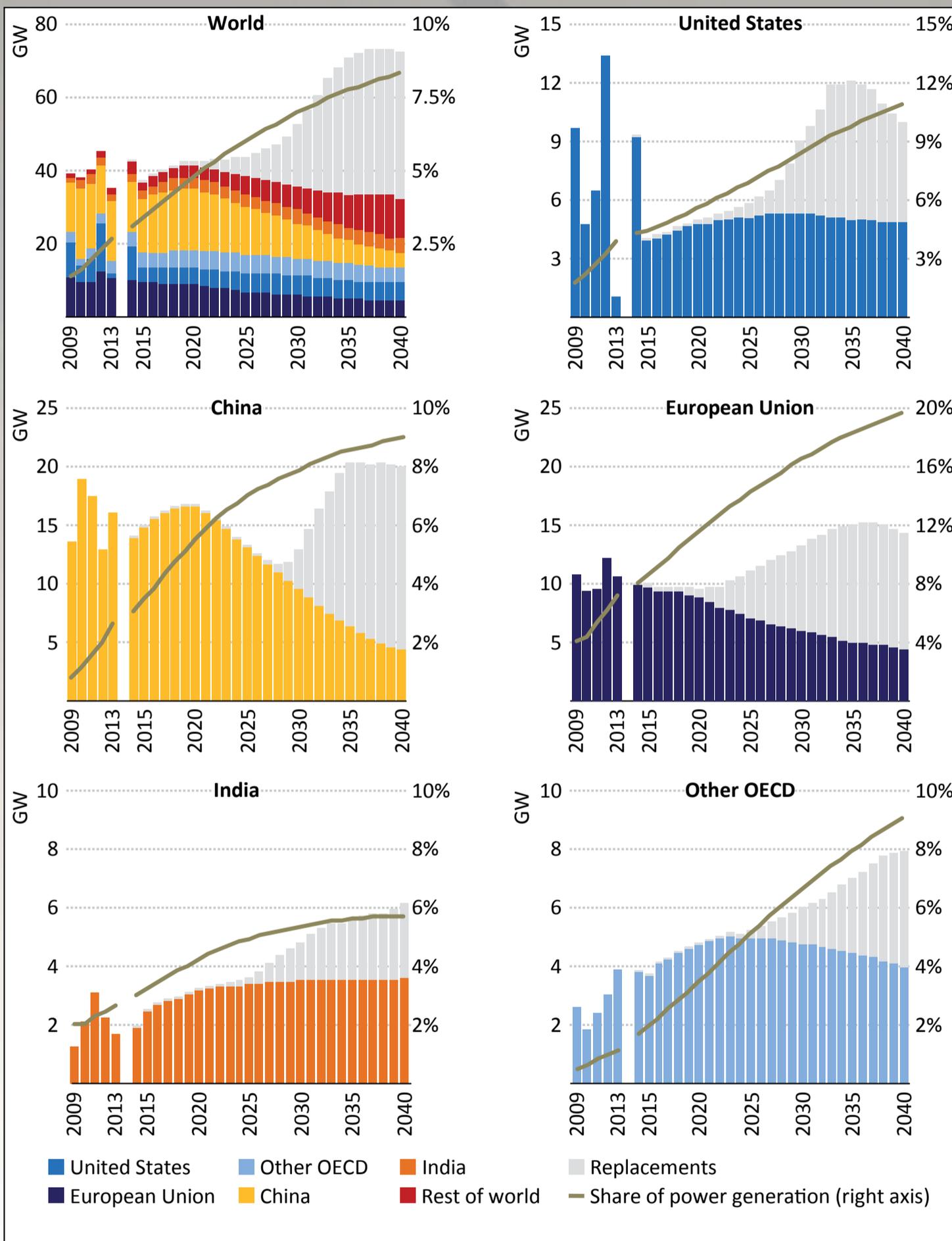
Caucasus Pipeline (SCP) through the Caucasus, the new-build Trans Anatolian Gas Pipeline (TANAP) across Turkey, and the new Trans Adriatic Pipeline (TAP), which will run across northern Greece and Albania to southern Italy. The proposed TCGP would connect with the SCP at Sangachal, south of Baku.

Recent meetings between EU, Turkmen, Azeri and Turkish officials suggest that there may at last be some genuine action on the Turkmen gas to Europe idea.

European Commission Vice President for Energy Union, Maros Sefcovic, met with Turkmen President Gurbanguly Berdimukhammedov in May for what was reported as decisive talks. Sefcovic is said to have left the meeting with Berdimukhammedov, saying that Turkmen gas would begin to reach Europe in 2019.

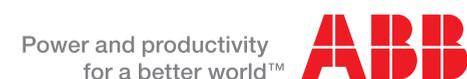
Much optimism has been expressed about Turkmen gas and Europe during the last 20 years. The possibility is there, but will Ashgabat take the plunge?

Wind power capacity additions and replacements, and share of total generation by selected region in the New Policies Scenario



World Energy Outlook 2014, © IEA/OECD, Figure 7.14, page 264

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A triple lock approach

As the UK prepares for a new generation of nuclear power plants, *TEI Times* analyses its preparation and what others might learn from a country that boasts a long and solid nuclear history.

The UK's nuclear industry is one of the oldest in the world, starting up the world's first commercial-scale nuclear power reactor in 1956. Today, nuclear only accounts for just under 20 per cent of the generating mix but there is a commitment to replace the largely ageing fleet.

In order to help meet its greenhouse gas reduction targets, the UK is preparing to build a new generation of nuclear plant. As the programme to build 16 GWe of new nuclear capacity by 2030 kicks off, the UK has put some key policies and procedures in place that other countries can learn from.

According to Lloyd's Register, the UK's vast experience in the nuclear sector has helped it to create a new construction programme that follows a simple rule of engagement: never start an engineering project before completing every detail and ensuring the supply chain arrangements. In that way, it says, vendors and financiers are encouraged by process and cost visibility, and the government gains assurances on security of supply.

Certainly the Electricity Market Reform and the crucial Contracts for Difference (CfD) tariff scheme, which guarantees a predictable return on investment over the lifetime of the project, has been crucial to attracting investors. However, the government has also put other enablers in place to ensure as far possible that projects will be built safely with minimal delays.

One of those key measures is empowering the Office of Nuclear Regulator (ONR) to carry out pre-license Generic Design Assessments (GDA) in conjunction with the Environment Agency (EA).

The ONR introduced the GDA to create a 'two-phase' nuclear licensing process, adding another level of technical assurance and oversight.

Professor Mamdouh El-Shanawany, former Head of Nuclear Safety Assessment Section at the International Atomic Energy Agency (IAEA) and now Global Nuclear Technical Director, Lloyd's Register, Energy, said: "The first stage is basically to look at the design to see if there are any show-stoppers. The focus here is on the design, not linked to the site or any potential environmental conditions."

The two-stage process ensures that only reactor designs that meet the safety requirements of the regulator are considered for site-specific licences, the second stage of the process.

Each nuclear site licence is unique to the individual site. The licence and its conditions apply at all times throughout the nuclear lifecycle of a site and, therefore, covers aspects such as design, construction, commissioning, operations, maintenance, modifications, decommissioning, etc.

The two-phase licensing process was designed in part to give reactor

vendors and investors greater confidence that the application for any site licence was likely to be successful, minimising, for example, the potential for costly project delays due to unforeseen regulatory issues.

The GDA requires engagement between the ONR and reactor-design companies with regard to elements such as the technical assessment of submissions, consultation with overseas regulators, the comments process, consultation and reviews.

Permits for new nuclear power stations are only granted if the design and its potential operators meet the high safety, security, environmental and waste-management standards required by the ONR.

Professor El-Shanawany describes the UK's approach as a "triple lock" in terms of safety. He explained: "The first lock is that the industry itself provides evidence that everything is according to the correct procedures and design. The second lock is to have this all independently evaluated by a third party. The third lock is the UK regulators. You have to have all three locks to fail to start compromising the situation."

"In addition, no organisation would receive a licence unless they demonstrate that they are capable of supervising construction and operating the plant. So the infrastructure of any organisation applying for a UK licence has to be checked and meet the UK's requirements before we even start to look at the technical aspects."

According to Lloyd's Register, the UK regulatory process is not a prescriptive, 'check-box' undertaking; it encourages the setting of 'goals' that the licensee is responsible for meeting, and which are in line with the most stringent global safety standards and procedures.

The requirement for risks to be reduced to 'as low as reasonably practicable' is fundamental to the process, says the company, and it applies to all activities within the scope of the nuclear regulations. It is a requirement to take all reasonable measures to reduce risk by applying global best practices and standards.

Putting on his ex-regulator hat Professor El-Shanawany explained: "The most important word I would use here is 'evidence'. We expect the design to provide adequate evidence to support the claims that it can be constructed, operated and decommissioned safely, following the best international practices and above all meeting the UK regulatory requirements."

The UK hopes that its detailed approach will not only guarantee the implementation and operation of safe designs but will also help avoid the construction delays and cost overruns seen at the Olkiluoto 3 (OL3) plant being built in Finland by Areva. The new generation EPR reactor projected to cost €3.3 billion, is now close to €10 billion and will be 10 years behind schedule.

Michael Kruse, a Partner and head of the Central European Energy & Utilities practice at Arthur D. Little, commented: "At OL3 not all issues – such as I&C for example – had been fixed, which caused delays due to the Finnish regulator STUK not accepting the design."

"There have been challenges in managing the design requirements. During the construction phase, new design and safety requirements have been imposed on Areva. Also the safety and design criteria, as well as relevant technical standards, were not clarified early enough. There was a lack of transparency on how requirements at plant level would be translated into the design of systems, structures and components, which caused acceptance issues after they were installed. It was also not clear which regulatory approvals would be needed during the project (hold points), and which were known and understood by the licensee and vendor."

Kruse noted that for the owner it is crucial to have an "agile" organisation that is able to cope with design changes and manage the regulator-supply chain interface to prevent the schedule slipping.

Perhaps, as a first-of-a-kind project, this should have been expected to some degree. Even so, the licensing procedure and design is only one part of the equation; the supply chain is also crucial.

The designs proposed for the UK are international and the government has been taking steps to ensure the UK manufacturing industry benefits from the new build programme.

However, although a major item such as the pressure vessel is unlikely to be built in the UK, the key issue is to demonstrate to the government that the supply chain is in place. The supply chain is the responsibility of the vendor and it is important that long lead items such as the pressure vessel are ordered well in advance so that they do not create a bottleneck to the construction.

Professor El-Shanawany added: "You also need to provide evidence to the regulator that you will be meeting order requirements so that there are no last minute surprises."

The other new EPR project being built in Europe by Areva is a case in point. At Flamanville 3 (FL3) in France, the carbon content in the pressure vessel, which affects the toughness of the material, was recently found to be incorrect – a discovery that has come very late in the day.

"Although this had nothing to do with the basic design, our argument here in the UK would be that the right processes and procedures should be in place to avoid this. Usually there are a number of inspections that should be done continuously from day-1," commented Professor El-Shanawany.

In a large infrastructure project, such as a nuclear plant, it is virtually impossible to anticipate every



Professor El-Shanawany: We expect the design to provide adequate evidence to support the claims that it can be constructed, operated and decommissioned safely

potential problem, especially on a first-of-a-kind design. Clauses and contracts can be put in place to hedge the impacts of some of the issues encountered at OL3 and FL3, but Kruse believes that the right licensing procedure and close liaison between all parties involved is the best way forward.

"In my view, only the following can prevent those issues [seen at OL3 and FL3]. Firstly, choose a licensable and proven design (i.e. no first-of-a-kind with clarification of all design requirements upfront), and strong nuclear supply chain with qualified suppliers. There should be a firm license that has no surprises or objections from the public or other opponents.

"Second, there must be stable political and regulatory conditions, where all requirements and 'rules of the game' are clear and stable for the entire project. Thirdly, there should be a capable and pragmatic regulator. In the case of OL3, STUK might not have been the easiest regulator to deal with.

"Finally there should be a partnership or colleague' approach from all parties (suppliers, government, regulator) to get the plant online in a safe manner – i.e. with no compromise to safety. But the process needs to be managed pragmatically."

This last point was echoed by Professor El-Shanawany who concluded: "Recently one organisation changed its approach from a stick approach to a carrot approach. If a vendor imposes heavy penalties on a supplier or subcontractor, the end result could be bankruptcy for one of the parties and the project ends up stuck. Instead, they are now giving incentives to get it right and be open. This is a very positive approach. It is better to take the 'one team' approach as opposed to 'you and I' or separate groups."

Still banking on offshore

Although there is still some way to go in driving down costs, the offshore wind industry has come a long way and is arguably ready to compete with some energy sources. **Junior Isles**

The offshore wind industry has come a long way. It was only 13 years ago that Horns Rev 1, the first large scale offshore wind farm, began operation. At the start of May, that wind farm off Jutland's south-western coast at Blåvandshuk, Denmark, achieved the milestone of generating 100 GWh of electricity.

Over the last decade or so, the wind industry as a whole – both onshore and offshore – has seen phenomenal growth. And while offshore wind has faced more challenges, growth has still been impressive. According to the Global Wind Energy Council, in 2014 some 1713 MW of new offshore wind capacity was added, bringing the total to 8759 MW.

Yet while wind power has been a remarkable success story, in recent years it has not been all plain sailing.

For a combination of reasons, including the effects of the economic crisis and policy uncertainty, growth has been flat for the last four years.

According to the GWEC the last significant jump in annual market size was in 2009, when the market grew by over 40 per cent in comparison with 2008, to just over 38 GW. Since then, it has hovered around the 40 GW mark, with major ups and downs in the US and an end to the exponential growth in the Chinese market.

Most notably, however, there has been little or no growth in Europe. GWEC data shows that at present, more than 91 per cent (8045 MW) of all offshore wind installations can be found in European waters; mainly in the North Sea (5094.2 MW: 63.3 per cent), Atlantic Ocean (1808.6 MW: 22.5 per cent) and in the Baltic Sea (1142.5 MW: 14.2 per cent).

The dramatic slowdown in Europe is obviously a cause for concern. Industry players cite several reasons, the key one being policy uncertainty.

Michael Hannibal, Offshore CEO of Siemens' Wind Power and Renewables Division commented: "The predictability of the regimes, and having long term regimes, is the main challenge."

He explains that the industry needs predictability in order to make the investments in research and development, as well as manufacturing. Hannibal used the UK as a case in point.

"If you look back, you will recall all of the announcements of those companies in the supply chain wanting to come to the UK – turbine manufacturers, sub-suppliers, foundation manufacturers, etc. But then there was a shift in the regime from ROCs (Renewable Obligation Certificates) to CFDs (Contracts for Difference).

Although the CFD supports new inward investment, the uncertainty of shifting from ROC to CFD and the uncertainty over the future market volume, resulted in only Siemens investing and building factory capacity."

High and predictable volumes along with an established supply chain are an important part of driving down the cost of offshore wind.

"When you talk about industrialisation, then standardisation also comes into it. There has to be further standardisation if you want to take out further costs from offshore wind," commented Hannibal.

While electricity from onshore wind farms is already cheaper than conventional power in an increasing number of markets, relatively high costs remains the biggest challenge for offshore wind development.

"If we as an industry do not live up to the obligation and come together in lowering the levelised cost of energy (LCOE), then we will kill our own industry," stressed Anders Soe-Jensen, Vice President Offshore Wind, Alstom.

According to a study published by Ernst & Young (EY) in March this year, offshore wind cost could be reduced to €90/MWh (\$94/MWh) by 2030. The report commissioned by the European Wind Energy Association (EWEA) says that the sector will have nearly reduced the LCOE to €100 per MWh by 2020, by which time cumulative installed capacity in European waters is expected to have tripled to 23.5 GW.

Key actions to reduce cost, says the report, include: deploying larger turbines to increase energy capture (a 9 per cent saving); encouraging greater competition (7 per cent); commissioning new projects – keeping volume up (7 per cent) and tackling supply-chain challenges (3 per cent).

Connections are also vital, not just in terms of helping reduce costs but perhaps more importantly in actually bringing new generating capacity online. The issue of connections has been a particular problem in Germany, where wind will play a key role in its transition to renewables, or *Energiewende*.

"Some of the challenge has been due to complicated connection systems, where an onshore substation has been adapted for offshore," said Hannibal. "Siemens therefore, through an innovative approach, launched a simplified version, which brings together two things: simplicity and standardisation. Standardisation allows significant cost reduction, so we are bringing savings on the transmission systems. This will be a big contributor to bringing down the costs of offshore wind."

Commenting on the grid connection issues, Soe-Jensen says "there are still issues" across Europe.

"If you look at the transmission network you see a huge increase in the construction, or planned construction, of grids by the TSOs (Transmission System Operators). This has to happen or we cannot have effective distribution of electricity. You saw this in Denmark where the price of electricity went down to zero because they could not export it fast enough.

"You have to divide it in two themes: one is the offshore grid connection,

direct to the wind farms; the other is for distributing the electricity. I think the distribution agenda is getting stronger. There are still problems with gaining consent for offshore grid connections that need to be resolved but it will not be too long before we see the transmission agenda becoming stronger."

As grid infrastructure grows to match country ambitions the UK, Germany and Denmark will remain the main powerhouses for offshore wind growth. According to the turbine suppliers, Belgium, the Netherlands and France are also becoming interesting markets.

Outside of Europe, governments have set ambitious targets for offshore wind. The GWEC-led FOWIND consortium is developing an offshore wind roadmap for India, and other markets such as Brazil have raised interest in future offshore development. Development is already starting to take off in China, Japan, South Korea, Taiwan and the US.

Notably, at the end of April, Deepwater Wind began construction of Block Island, in Rhode Island. The 30 MW, which will use five Alstom Haliade 150 6 MW offshore wind turbines, will be the US' first offshore wind farm when it starts up in 2016.

Commenting on the US market, Soe-Jensen said: "We are looking at a market of 1-3 GW, mainly in the northeastern states where you have the wind and the high power prices that can sustain offshore wind. Elsewhere there is no doubt that some support, whether production tax credits or otherwise, is needed to get offshore wind off the ground. But I do believe there is a market in the US. Dong Energy is the most significant offshore player in the world and they have been buying the rights in various US projects."

Siemens is also confident in the US market. Hannibal echoed Soe-Jensen in saying: "It is encouraging to see proven developers getting into some of the zones that are now laid out. That could be a signal that it will materialise."

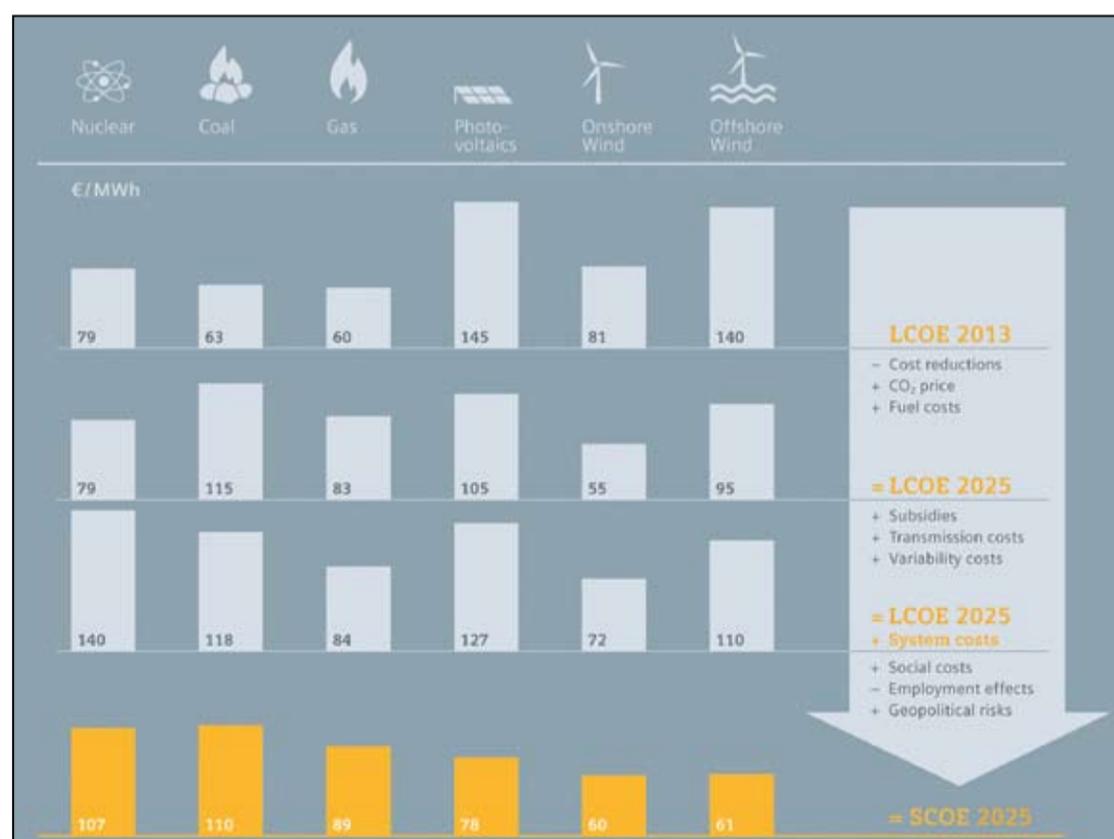
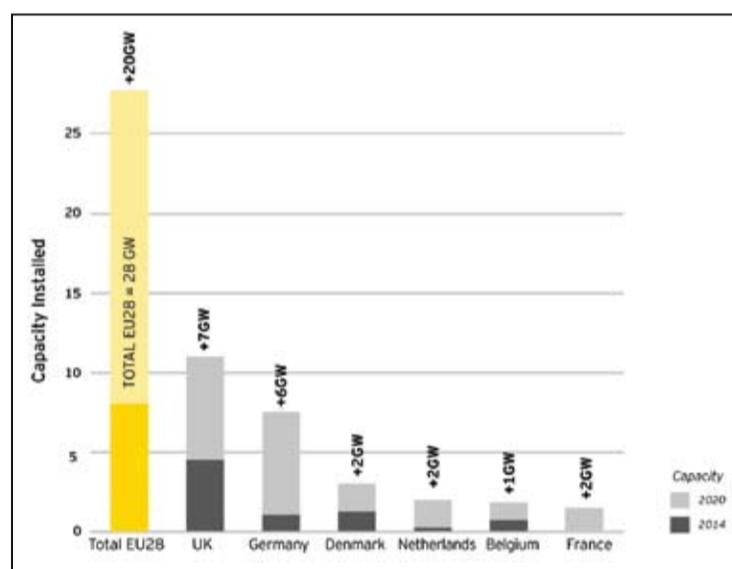
Block Island is significant not only because it is the first in the US, but also because it is fully financed, having raised some \$290 million in debt and equity funding. "It proves that our turbine is bankable," claimed Soe-Jensen.

This demonstrates that offshore wind is a maturing market. "There has been a paradigm shift in financing [offshore wind projects]," said Hannibal. "On the equity side there has been good interest from pension funds, infrastructure funds, industrial players etc. The projects that are well managed and run have a good subscription of interest."

He concluded: "In a short period, we have gone from a few turbines in the water to real power plants at sea that are seen as a safe investment. We in the industry have been too silent in what we have achieved. If you look at the latest CFD for Hinkley Point C and compare it like-for-like – and include the cost of decommissioning and the societal costs if something goes wrong – offshore wind is ready to compete with nuclear today. We can be proud of what we have achieved."

A breakdown of potential EU growth in 2020.

Source: *Offshore wind in Europe: Walking the tightrope to success* March 2015. Published by EY



Siemens has created a new calculation model that represents the real cost/benefit ratio as a macro-economic yardstick – Society's Cost of Electricity (SCOE). The chart shows a comparison of LCOE and SCOE for all primary energy sources in the UK. Courtesy: Siemens AG Wind Power

Technology

Refining the oil fired approach

UK company Quadrise has developed a fuel that it says will not only boost refinery profits but is also a more economic and cleaner alternative to heavy fuel oil. Junior Isles, reports.

The idea of using an oil-in-water emulsion as a substitute for heavy fuel oil (HFO) is not a new one. Back in the late 1980s and 1990s, the production and use of Orimulsion was gaining traction in South America before being brought to an end by a change of government in Venezuela.

Now UK company Quadrise, started by ex-BP employees involved in the original Orimulsion sector, looks set to commercialise a new oil-emulsion fuel which can be used as a low cost and much cleaner substitute for HFO in marine diesel engines (two- and four-stroke) and for thermal power and steam generation.

The fuel known as MSAR® (Multi-phase Superfine Atomised Residue) is described by Quadrise as a "potential game-changer" for oil refiners as it frees up valuable distillates used for HFO manufacture, thus increasing profitability without incurring significant expenditure.

For the power sector, the technology is centred around displacing HFO so that boilers are instead fired on what the company says is a "far superior" fuel in terms of combustion. Quadrise is convinced it could save owners of oil fired power boilers millions of dollars a year as well as significantly cut emissions of air pollutants.

Sam Saimbi, General Manager Power at Quadrise described the thinking behind the technology. "To produce HFO, refiners take the 'bottoms' off their process. This residue has a high viscosity, so they use high value distillates, such as diesel, to lower the viscosity so it's ready for transportation. Sometimes it can be up to a 50:50 split to create HFO. Instead of using premium distillate fuels to do this, we can use a combination of water and a few chemicals.

This produces a far better fuel that is easier to handle and store; in addition the residue has comparable calorific value. Overall it offers the end user an economic solution as well as a saving for the refinery."

Quadrise has been developing the technology since around 2004, when it partnered with AzkoNobel to further develop MSAR using the company's proprietary emulsification technology.

MSAR production is a fairly simple and proven process.

In the first stage, oil residues are taken from refinery rundowns and cooled to under 200°C to achieve the required viscosity (typically 300-400 centistokes). Water (about 30 per cent), which can be derived from several utility or wastewater sources, is then added to the residue. In the third step, special surfactants and chemicals are added to stabilise the emulsion for long term storage and transport, and to promote complete combustion. Finally, the mixture is processed in a proprietary MSAR unit to a high hydrocarbon content (typically 70 per cent) stable oil-in-water emulsion (100-500cSt at 50°C depending on client specification).

"The key to this technology," said Saimbi, "is after you have emulsified this residue with the water and the surfactants, you end up with a fuel that has a far smaller particle size distribution than can ever be achieved with HFO. In a furnace, where you have a fixed geometry and there is a fixed residence time for the fuel to burn, a smaller particle means complete combustion."

He noted that part of the problem with HFO is that even after atomisation, particle size is in the range of 80-100 microns. This compares with 5-10 microns in MSAR fuel. In addition to complete combustion, less

oxygen is needed. This all leads to minimal unburned carbon in the ash and hence significantly less particulates. Not only does this save fuel, it also produces less ash and therefore saves on the cost of ash disposal.

In terms of storage and handling, MSAR is very similar to HFO. However, since the viscosity is lower, it is stored at a lower temperature (25-50°C). It has similar flame characteristics to HFO but has a lower peak flame temperature by about 100°C due to the water content. Notably, this cooling effect should typically result in 20-50 per cent less thermal NOx, while the smaller particle size means there is less than 5 per cent carbon in ash compared to HFO.

According to Quadrise, making the advance from Orimulsion to MSAR production is very easy and a proven and secure process. "In essence, Orimulsion was produced in some fairly big capacities, so all we've done is optimise that solution. We would simply provide – and install if necessary – the refinery with a blending plant and a technology licence."

The first use of MSAR fuel will likely be in the marine sector, where Quadrise has been working with shipping giant Maersk to use MSAR in large diesel engines.

"We have been working with Maersk since 2010 to de-risk every element in terms of the production, distribution, bunkering and finally firing MSAR in the engine of a commercial ship," advised Sam Saimbi. "We are now planning the final validation – a LONO (Letter of No Objection) test. On success, we anticipate commercial rollout."

Saimbi joined Quadrise in January this year to spearhead the effort in the power sector, where he believes there are significant opportunities.

Quadrise is in discussions with Singapore utility Power Seraya, which was a customer for Orimulsion and is therefore already adapted to accept the fuel. MSAR, however, is also well suited to oil fired plants that have never burned Orimulsion, says the company.

One of the effects of having 30 per cent water in the fuel is that there will be an increase in flue gas weights compared to fuel oil, similar to the impact of firing natural gas. This is not a problem for a new boiler installation, which would be designed according to the fuel. For a retrofit, however, the effects on the boiler still need to be considered.

"Generally, there will be a 3-5 per cent increase in gas weight but this can be mitigated by reducing the oxygen for combustion, due to the smaller particle size. But each retrofit is different, so you have to undertake a due-diligence and review of the boiler margins" said Saimbi. "We don't foresee any modifications to the boiler pressure parts but new atomisers would be needed to cater for the increase in fuel volume going into the boiler. This would be at minimal cost."

The development with Power Seraya is still in the early stages. Quadrise needs to find a refinery that is prepared to adopt the technology and deliver the fuel to the utility at a competitive price, with the required quality and reliability.

Saimbi says this is a complex

process. "You can imagine the challenge to the business. Not only do you have to find a refinery to adopt the technology, you also have to find an off-taker for the fuel. You need to find and align all the stakeholders, which naturally takes time."

The initial focus is therefore on the Kingdom of Saudi Arabia (KSA), which is a big oil refiner and user of oil for power production. "With these being in the same country, logistics become a bit easier. For us, it's a huge market," said Saimbi.

Although profits will be on a case-by-case basis and will depend on what distillate the refinery is mixing with the residue, Quadrise believes it makes economic sense for a number of KSA's refineries to adopt MSAR.

One case study for a Middle East refinery showed that the installation of MSAR technology would enable an increase in distillate production of more than 30 000 barrels/day, resulting in a net profit of \$100 million/year. This was for a capital outlay of well under \$50 million.

Such an installation could be executed with very little downtime. "It would be installed while the refinery is in operation. It is just a case of installing the blending plant and then carrying out the final tie-ins, which could be done in a couple weeks. Overall, with installation and commissioning, it's a 12-month programme," said Saimbi.

For power plants, again the economics will vary case-by-case. "It's difficult to give figures – every plant is different; it also depends on what distillates are being replaced," stated Saimbi.

He added: "Every boiler is different. For example at some oil fired plants in KSA, unburned carbon in ash is more than 80 per cent. We believe we can get this down to less than 5 per cent but you don't know until you have carried out the tests. This would save on fuel as well as on the cost of removing the fly ash. In one example we are reviewing, it's costing the plant a lot of money to transport and dispose of the fly ash. If you add all the benefits, you could save millions of dollars a year."

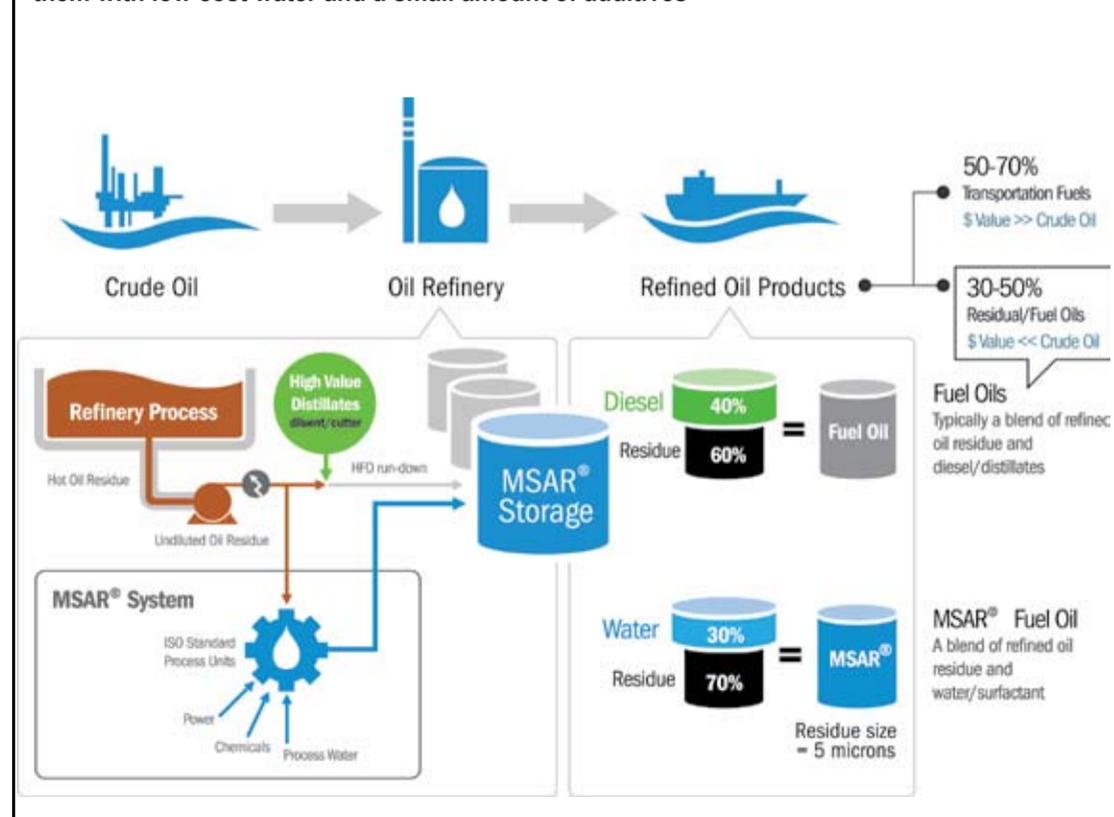
Quadrise's current business model would see any profit margin split between itself, the power plant owner and the refinery. "The power plant would have an incentive because they would be purchasing a less expensive fuel," noted Saimbi.

With a clear economic case, at least in Saudi Arabia, plans are moving forward. A utility scale demonstration in KSA is targeted to produce and fire MSAR fuel in the first half of 2016. Saimbi says commercial rollout will follow, once this is proven.

With discussions also under way in Latin America, prospects look promising but Quadrise is taking it one step at a time.

Saimbi summed up: "For us the challenge right now is to get the product to the market. We are all working hard and are focused to make this happen. We know it will take time, so we are taking it step-by-step. The focus is first to have one of our current prospects working as highlighted, and then there will be a domino effect."

MSAR technology frees up valuable distillates traditionally used for HFO blending, replacing them with low cost water and a small amount of additives





Junior Isles

Testing the climate in Cannes

The Cannes Film festival may seem an unlikely setting for climate debate, yet several film-makers used the festival to express their keenness to tackle the issue. Perhaps it was no coincidence, as the festival coincided with Paris Climate Week.

While Paris Climate Week could never match the glitz and glam of Cannes or the high-powered action on screen, it had its share of heated debate.

The Business & Climate summit – the centrepiece event of Paris Climate Week – saw more than 1000 business leaders, including the CEOs of Royal Dutch Shell, Statoil, Total and Unilever turn up in response to calls from the UN for the private sector to take a more active role in tackling climate change.

Global business leaders were joined by political leaders and senior climate negotiators in preparation for an agreement on reducing carbon emissions at the UN's COP21 climate summit in Paris later this year.

There was no red carpet but one of the main highlights saw French insurance group Axa become the first global financial institution to turn its back on investments in coal companies.

Axa, which has more than \$1 trillion

in assets under management, announced that it will sell €500 million of coal assets between now and the end of the year. The company also said it would put €3 billion into green investments between now and 2020, mostly in clean technology, green infrastructure and green bonds.

Chief Executive Henri de Castries told delegates: "The facts are undeniable. If we think we can live in a world where temperatures would have increased by more than 2 degrees Celsius we're just fooling ourselves."

"It is very likely that all the agreements coming in will not add up to what we need to stay below 2°C... That is why we are mobilising the private sector."

Axa plans to divest interests in mining companies that get more than half of their turnover from coal mining, and electric utilities producing over half of their energy from thermal coal plants.

The move is significant in that it is a major financial institution that is taking the step. But it is questionable how much difference it will make – at least in the near term.

Most agree that there has to be a shift away from burning fossil fuels in order

to avoid global warming but it is probable that fossil fuels will be around for some time to come.

While acknowledging that Saudi Arabia would one day stop using oil, gas and coal, Ali al-Naimi, the Kingdom's oil minister, said calls to leave the bulk of the world's known fossil fuels in the ground to avoid risky levels of climate change needed to be put "in the back of our heads for a while".

He said the Kingdom plans to become a "global power in solar and

of systemic risk in the economy." He added: "The vast majority of companies want to see a managed transition to a low-carbon future and not costly, last-minute regulation or climate chaos."

World leaders have already agreed in previous UN talks to curb emissions enough to avoid global temperatures rising more than 2°C compared with pre-industrial times. However, most agree that that the commitments expected to be gathered by countries will be insufficient to stay within the agreed target.

They are therefore calling on policy-makers to agree on carbon pricing mechanisms, closer collaboration between business and government on climate policies and a joint public and private sector fund for investing in low-carbon technology, particularly in developing countries.

The Business & Climate summit aimed to address several key questions, the most prominent being: how can business work with government to support development, grow the economy, and limit global temperature rise to 2°C?

In the expectation that the necessary emissions reductions or their policy requests will not be finalised in December, Patrick Pouyanné CEO of French oil group Total said: "We have to be pragmatic." He told the *Guardian* newspaper: "If we take the sum of commitments made by countries, then I am afraid we will not be on the 2°C trajectory. There will be a gap."

"But what is important from the UN talks in December is to have a convergence of companies on the one side and governments on the other. At least some commitments by governments and businesses, and a mechanism in place to improve it."

Paris Climate Week may not have been able to say it like Cannes but it demonstrated that there is a real commitment among business leaders to not just play their part but to take the lead and pick up the slack where policy falls short.

The willingness of energy-intensive businesses in particular in tackling climate change has often been questioned. At the summit, however, Unilever CEO Paul Polman suggested the private sector could help close the shortfall in emission commitments made by governments.

"It is very likely that all the agreements coming in will not add up to what we need to stay below 2°C. [Those commitments] will be around 40 per cent of that in reality. That is why we are mobilising the private sector. If we work together we can close that gap."

At Cannes Charlize Theron, co-star in the recently released *Mad Max: Fury Road*, cautioned that the drought and deserts depicted in the film would likely become a reality unless action was taken. "What makes the film even scarier is that something like that is not far off if we don't pull it together."

Mad Max is set in the future, where the world is a desert wasteland and civilization has collapsed. This dystopian future, originally conceived in the 1970s, is the aftermath of a nuclear war. But who is to say it could not be the result of catastrophic global warming? The energy industry has a big responsibility.

