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Sendai restart raises questions

Former Prime Minister Naoto Kan called the restart a "huge mistake"



The restart of Japan's Sendai unit 1 reactor is good news for the nation's economy but many still question the government's decision to continue with nuclear power, writes **Junior Isles**

With the majority of people opposing nuclear power, critics are questioning the Japanese government's decision to restart the Sendai Unit 1 nuclear reactor.

Naoto Kan, the Prime Minister who led Japan during the 2011 tsunami and nuclear disaster, described the restart of the unit on August 11 as a "huge mistake" by an industry in decline. "Nuclear power generation is a technology of the 20th century," he said. "As a source of energy, it is inferior from the long-term point of view."

His view is echoed by public sentiment, with a recent poll showing that 57 per cent of the public are against

any reactors being restarted.

Sendai unit 1 is the first of Japan's 43 operable reactors to be restarted since the decision was taken to close the nation's fleet following the Fukushima Daiichi nuclear accident in 2011.

Most of Japan's nuclear reactors were unaffected by the tsunami and earthquake of March 11, 2011 and continued to operate until they reached their next scheduled shut down. However, not a single nuclear reactor has operated for almost two years as they were progressively idled after the accident.

The closures have seen electricity prices for industry soar by 19-40 per

cent, as the country has had to depend on expensive imported fossil fuels for baseload generation. Eager to ease the impact on the economy, Prime Minister Shinzō Abe has been keen to restart the reactors.

The resumption of nuclear electricity generation is "an important step forward" in securing more stable power supply, Economy, Trade and Industry Minister Yoichi Miyazawa said in a statement.

This was echoed by Agneta Rising, Director General of the World Nuclear Association (WNA). "This is a hugely important step which sets the country firmly on the path to restoring its trade

balance and regaining energy independence, as well as reducing emissions," she said.

For Kyushu Electric, the plant's owner, Sendai's start-up will enable the company to supply electricity without power procurement from other utilities. The utility expects its business, which has been hurt by the high cost of importing fuel, to improve drastically and return its balance sheet to the black for the first time in five years in the fiscal year to March 2016.

In September last year, the utility's two-reactor Sendai complex became

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Cost of renewables have declined significantly, says IEA

The International Energy Agency (IEA) has issued a report that clearly demonstrates that the cost of renewable technologies – in particular solar photovoltaic – have declined significantly over the past five years, and that the cost of electricity from these technologies is competitive with conventional technologies.

In its recent 'Projected Costs of Generating Electricity – 2015 Edition', published in conjunction with the Nuclear Energy Association, the IEA concluded that solar PV in particular has seen significant declines in levelised cost of electricity (LCOE) since the previous study, though on-shore wind remains the lowest cost renewable technology.

The report is the eighth in the series on the levelised costs of generating electricity. It presents the results of work performed in 2014 and early 2015 to calculate the cost of generating electricity for both baseload electricity generated from fossil fuel thermal and nuclear power stations, and a range of renewable generation,

including variable sources such as wind and solar.

Speaking at the launch of the report Laszlo Varro, the IEA's Head of Gas, Coal and Power Markets said: "Compared to the last report, there has been a very clear shift in the investment interest, with a majority of responses coming from the low carbon technologies.

"The emerging picture is that on-shore wind is still leading in cost competitiveness in practically all of the cost of capital choices. Offshore wind is still an emerging technology and the costs are significantly higher than the other major renewable technologies."

He also noted that for solar PV, especially with the higher cost of capital, large ground-mounted solar PV projects have a significant cost advantage over residential projects.

The report is the first published since the last one in 2010. Notably, the IEA stated that while the 2010 study showed a significant increase in the cost of baseload technologies,

the new report suggests that any such cost inflation has been arrested.

"This is particularly notable in the case of nuclear technologies, which have costs that are roughly on a par with those reported in the prior study, thus undermining the growing narrative that nuclear costs continue to increase globally," it stated.

According to the IEA, there was very strong competition in terms of the LCOE from the three main baseload technologies – coal, gas and nuclear – at higher cost of capital. It said, however, that nuclear has an advantage in the low cost of capital scenario.

The IEA stated that "caution must be taken when attempting to derive broad lessons from the analysis".

It said that despite the general relevance of its conclusions, the cost drivers of the different generating technologies remain both market- and technology-specific. As such, it said there is no single technology that can be said to be the cheapest under all circumstances.

"As this edition of the study makes clear, system costs, market structure, policy environment and resource endowment all continue to play an important role in determining the final levelised cost of any given investment," stated the report.

The analysis within the report is based on data for 181 plants in 22 countries, including three non-OECD countries. This said the IEA covers roughly 75 per cent of the global electricity system.

The forward-looking study is based on the expected cost of commissioning plants in 2020. For the first time, the analysis was performed using three discount rates (3 per cent, 7 per cent and 10 per cent).

The study is published roughly every five years. Commenting on what it expects to see in its next edition, Varro said: "We will have a chapter dedicated to residential electricity storage. Also, by 2020 we will take a very strong look at the system value of the technologies."

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the first nuclear facility to pass the Nuclear Regulation Authority's safety test based on the new regulations, a prerequisite for being allowed back online. Kyushu Electric plans to restart the Sendai No. 2 reactor as early as October.

Separately, three reactors at two plants have also obtained the regulator's safety clearance. A reactor at Shikoku Electric Power Co.'s Ikata plant could come back online this winter at the earliest after obtaining local approval.

However, the outlook is less certain for two reactors at Kansai Electric Power Co.'s Takahama plant after a court in April banned the utility from restarting the units, citing safety concerns.



Sendai No. 2 reactor could restart as early as October

The ongoing safety concerns demonstrate the uphill struggle the country faces in restarting the rest of its reactors. The reactivation of Sendai sparked protests across the country.

The Abe government, however, insists that the reactor has only been restarted after passing the "world's most stringent safety standards".

In October 2012 the Nuclear Regulation Authority (NRA), which had taken over from the Nuclear & Industrial Safety Agency (NISA) and NSC, announced that nuclear power plant restart reviews would comprise both a safety assessment by NRA and the briefing of affected local governments by the operators. The assessment would be based on guidelines formulated by NRA in July 2013 after public consultation.

Apart from local government consent, NRA procedures include review and approval of the detailed design, followed by a plant inspection, as well as a separate assessment and approval of the operating management system. Only when the plant and its operators pass all these requirements can restart occur.

Opponents to the restarting of Japan's nuclear plants have highlighted the fact that the country records more earthquakes than any other nation and the Sendai facility is located 60 km from an active volcano.

Environmental groups and activists have warned that no adequate plan has been introduced for evacuating residents in the event of a Fukushima-style meltdown, where radiation leaks forced 100 000 people to be evacuated.

Meanwhile, challenges remain at the destroyed nuclear facility. Water is still being pumped into the reactors to prevent further meltdowns, and large amounts of it, now radioactive, have leaked out of the damaged containment chambers and into other parts of the buildings.

Removal of melted fuel from the three reactors – the most challenging part of the clean-up – will not begin until 2022.

Decommissioning of the Fukushima reactors is expected to take decades and compensation expenses have reached an estimated \$57 billion.

US gets serious on clean energy



The US Clean Power Plan is set to face a legal battle but demonstrates the commitment of the Obama administration to cleaning up its power sector, writes **Junior Isles**.

The US government is showing its determination to clean up emissions from its power generation sector with the unveiling of its Clean Energy Plan.

The rules issued by the Environmental Protection Agency (EPA) are designed to cut emissions from power plants and have been strengthened in terms of the long-term ambition as originally proposed by the president last year, but slightly weakened in the short-term in a concession to states reliant on coal.

The final rules call for a 32 per cent cut in carbon emissions from power plants by 2030 on 2005 levels, up from the initial proposal of 30 per cent. However states will only have to comply by 2022 rather than 2020 as originally proposed, and will be able to submit their plans on meeting the targets by 2018 instead of 2017.

Each state will have an emission-cutting goal assigned to it and must submit a proposal to the EPA on how it will meet the target. States that do not submit plans will have to follow one devised by the EPA.

Announcing the plan, US President Barack Obama said: "We are the first generation to feel the impacts of climate change, and the last generation to be able to do something about it."

Earlier, at a ministerial meeting of 46 nations in late July, Laurence Tubiana, France's chief climate official, said ministers had made progress in talks ahead of the Paris meeting in December. He highlighted the progress made on moves to ensure all countries assess and review their carbon reduction every five years.

The White House said the release of its Clean Power Plan was "the starting gun for an all-out climate push" by the President and his administration. The government believes the plan will boost the UN climate summit in Paris in December and encourage other countries to submit their own plans.

Commenting on the publication of the Clean Power Plan, Richard Black, Director of the Energy and Climate Intelligence Unit, said: "The announcement is the latest indication that the world has changed profoundly since the Copenhagen climate summit in 2009."

"Then, the US and China, the world's top two carbon emitters, both resisted a global agreement on climate change; and now they're both accelerating their own transitions to a low-carbon economy, as the Clean Power Plan and other announcements show."

The President's action imposes strict cuts on greenhouse emissions from the power sector but faces fierce opposition from Republicans and industry groups.

They say the policy written by the EPA, a regulator, breaches states' rights and will damage the economy by raising electricity prices and jeopardising the reliability of power supplies.

Patrick Morrissey, West Virginia's attorney-general, said: "This rule is the most far-reaching energy regulation in

the nation's history, and the EPA simply does not have the legal authority to carry it out.

The government, however, is calculating that the courts will uphold the rights of the EPA to regulate carbon emissions under the Clean Air Act, as they have done on several occasions in recent years.

An EPA spokeswoman said: "The Clean Power Plan is based on a sound

legal and technical foundation. To ensure that the Clean Power Plan's significant health benefits and progress against climate change are delivered to all Americans, EPA and the Department of Justice will vigorously defend it in court."

The plan has received unprecedented support from businesses, which hailed the Plan as the strongest action ever on climate change by a US President.

Major corporations like General Mills, Mars Inc, Nestlé, Staples, and Unilever joined with hundreds of companies to send letters of support to 29 governors across the country.

Goldman Sachs and Bank of America joined 11 other large US companies to make a series of climate change pledges that the White House says could lead to at least \$140 billion in new green investments.

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Shale sector loses out in Obama's climate plan

Plans to curb methane emissions from oil and gas wells have been criticised by the oil sector but would help the USA to make significant progress towards meeting its climate target.

Siân Crampsie

Oil and gas wells in the USA – including those at fracking sites – will have to meet new standards for emissions under plans revealed by President Barack Obama last month.

Just two weeks after announcing a finalised Clean Power Plan, the Obama administration said that it would crack down on emissions of methane and other compounds from the oil and gas sector in order to help the USA meet climate targets.

The plans were immediately criticised by the oil and gas sector as being too costly and running contrary to previous plans by the US government to make natural gas a key 'transition' fuel to bridge the divide between a fossil

fuel-based economy and clean energy sources.

Earlier in 2015 the USA set a goal to cut emissions of methane – a potent greenhouse gas – from the oil and gas sector by 40-45 per cent from 2012 levels by 2025. It says that the measures it has announced will account for half of that goal.

The measures include an expansion of the Environmental Protection Agency's (EPA's) 2012 New Source Performance Standards (NSPS) for the oil and gas sector to include upstream methane emissions, leak detection and repair at well sites and other sections of the transmission network, and proposals for new standards to reduce methane and volatile organic compound (VOC) emissions

from fracking wells.

The rules would only apply to new oil and gas sites, although environmental groups want Obama to tackle emissions from existing sites.

The EPA forecasts that the rules will affect around 15 000 new wells in the years up to 2025.

The American Petroleum Institute (API) said that the proposed rules were "duplicative, costly and [would] undermine America's competitiveness".

"The oil and gas industry is leading the charge in reducing methane," API President and CEO Jack Gerard said. "The last thing we need is more duplicative and costly regulation that could increase the cost of energy for Americans," said Gerard. "Even as oil and natural gas production has surged,

methane emissions from hydraulically fractured natural gas wells have fallen nearly 79 per cent since 2005, and CO₂ emissions are down to 27-year lows."

Gerard said that EPA's own analysis shows that methane emissions from hydraulically fractured natural gas wells have fallen dramatically.

"API supports a common sense regulatory approach that builds on cost-effective controls already required by EPA for new equipment," he said. "Combined with smart, voluntary efforts for existing sources, this approach will continue to lower methane emissions."

Natural gas has played an increasingly important role in the US economy, and in July surpassed coal as a fuel source for power generation for

the first time. While the government was keen to encourage growth in the shale gas sector, it appears now to have revised this stance, partly because of faster-than-expected growth in the renewables sector.

Previously the administration has foreseen a key role for natural gas as a low-carbon fuel, but it now believes that renewable energy as well as energy efficiency savings will play a bigger role in helping the USA to reach its climate goals.

■ The World Energy Council (WEC) says that shale gas could challenge the traditional dynamics of the global oil sector. Olivier Appert, WEC President, said that shale gas could become the new 'swing' producer that sets the price of oil, testing Opec's current role.

SunPower boosts PV pipeline

SunPower has diversified its portfolio of solar projects in the USA with the acquisition of a large project pipeline from Australia-based Infigen Energy.

The deal gives SunPower ownership of projects in varying stages of development in 11 states across the USA. It expects to offer some of the projects for sale to 8point3 Energy Partners, the yieldco joint venture formed by SunPower and First Solar.

Tom Werner, SunPower CEO and President, said that the acquisition would provide the firm with "an

expanded and geographically diverse portfolio of solar projects in the US that may all be generating cost-effective, emission-free power by the end of this decade."

■ The US Navy has signed agreements with Western Area Power Administration and Sempra US Gas & Power for the construction of a 210 MW PV plant that will supply energy to 14 Navy installations. The deal represents the largest purchase of renewable energy ever made by a federal entity.

South America set for smart grid boom

South America will become a key growth region for smart grid technology in the next decade, according to new research.

Analysis by Northeast Group indicates that countries in South America are aiming to boost smart grid infrastructure in an effort to address problems including poor grid reliability, operational inefficiencies and electricity theft.

According to Northeast Group, the

total investment in smart grid infrastructure in South America between 2015 and 2025 will be \$38.1 billion, covering advanced metering infrastructure (AMI), distribution automation (DA), wide area measurement (WAM), home energy management (HEM), information technology and battery storage.

Eight countries in the region are already running smart grid pilot projects, with Brazil's dating back to the

mid-2000s. Brazil also recently announced plans to install over 3 million new advanced metering devices, and is due to launch a variety of smart city projects.

Northeast Group believes that South America is an attractive investment prospect for smart grid companies because of the developing regulatory frameworks as well as the benefits that networks would derive from the technology.

AES signs up Grupo Bal

AES is set to expand in the Mexican energy sector with a new tie-up with Mexican firm Grupo Bal.

The US energy company wants to take advantage of a drive by the Mexican government to attract new investment to its energy and power generation sectors and told *Reuters* that the two companies would invest a combined \$2.5 billion over the next five years.

The investments would mostly be in the power sector, with up to 2000 MW of capacity being developed. The companies say they will look closely at upcoming capacity auctions to be held by Cencae, Mexico's new

independent grid operator.

AES operates pet coke-fired and combined cycle gas turbine generation facilities in San Luis Potosi and Mérida, supplying power to off-takers and other customers in Mexico. Its joint venture with Grupo Bal will have a 50-50 ownership split and will look to develop both conventional and renewable energy facilities.

AES will operate the power plants that the new venture builds. Cencae is due to publish bidding terms for upcoming auctions in October.

Grupo Bal is a Mexican conglomerate with operations in silver mining, retail and financial services.

Thar to research new recuperator technologies



Thar Energy has been selected by the US Department of Energy (DOE) to develop technologies for power cycles based on supercritical carbon dioxide (SCO₂) working fluid.

The firm has won a contract with the National Energy Technology Laboratory (NETL) to develop new recuperator technologies leading to more cost-effective and efficient SCO₂-based power cycles.

Power cycles based on SCO₂ working fluids have the potential for higher thermal efficiencies when

compared to state-of-the-art steam-based power cycles. However, the cost and effectiveness of the cycle's recuperators are currently seen as a barrier to the full-scale SCO₂ power cycle demonstration and economic viability.

Thar Energy and its partners will undertake a \$11.7 million programme to advance high-temperature, high-differential-pressure recuperator technologies suitable for use in SCO₂ recompression Brayton cycle, a likely candidate for the commercialisation

of SCO₂ power cycles. The focus of the programme is to evaluate, advance, and demonstrate recuperator concepts, materials, and fabrication methods that facilitate the commercial availability of compact, low-cost recuperators for use under Brayton cycle conditions.

The DOE will provide \$9.4 million in funding. Thar's partners in the project include Southwest Research Institute, Oak Ridge National Laboratory, Georgia Institute of Technology and Knolls Atomic Power Laboratory.



NZ continues transition to low carbon economy

- Renewable generation reaches nearly 80 per cent
- Oil and gas production down in 2014



Syed Ali

New Zealand's Energy and Resources Minister Simon Bridges says a recent government report shows the country is making real gains in transitioning to a lower carbon economy.

The 'Energy in New Zealand 2015' report released last month says the proportion of renewable energy in New Zealand's total energy supply reached a record high last year.

Bridges said in a statement: "As I announced earlier in the year, in 2014 renewable electricity generation hit 79.9 per cent, the highest level since 1996."

According to the report, renewable energy made up 39.5 per cent of New Zealand's total primary energy supply, up 1.3 per cent from the previous year.

Following its release Ministry of Business, Innovation and Employment (MBIE) manager of energy and building trends Bryan Field commented: "This is the highest contribution on record and places New Zealand third

on this measure internationally... This was due to strong growth in geothermal electricity generation in 2014."

The report also showed that the level of proven and probable remaining reserves of oil and gas produced was 115 million barrels, down 17 per cent from the end of 2013.

"The biggest factor in the reduction in remaining reserves of oil and gas was production during the year," Field said. "On the other hand, exploration activity in 2014 was high. All up, a total of 33 wells were drilled in 2014, 22 of which were exploration wells."

Last month it was also announced that New Zealand would be closing fossil fuelled baseload plant in the face of growing renewable generation.

Contact said it would close its 400 MW Otahuhu B combined cycle station. The station's output has been effectively replaced by geothermal generation. Dennis Barnes, Contact's Chief Executive said: "The role of thermal plant in New Zealand's electricity future is to support renewable

generation and the growth of new technologies. This is best met by fast-start, gas-fired peaking power stations rather than large baseload plants."

Genesis Energy also announced its last two coal-burning electricity generators at Huntly Power Station will stop generating by December 2018, signalling the end of large scale coal-fired generation in New Zealand.

Genesis' Chief Executive, Albert Brantley, said that the company has been looking to close its portfolio of four coal and gas-fired Rankine (steam) cycle generators since 2009, with two having already been retired.

Brantley went on to say: "The development of lower cost renewable generation, principally wind and geothermal, investment in the HVDC link, and relatively flat growth in consumer and industrial demand for electricity have combined to reinforce the decision to retire the remaining Rankine cycle units, which will deliver further operational efficiencies to Genesis Energy."

Support for Indian renewables

The International Finance Corp. (IFC), the World Bank's private lending arm, will target clean energy schemes for most of its approximately \$700 million in infrastructure funding in India in the fiscal year ending June 2016.

Sujoy Bose, IFC's global head for infrastructure and natural resources, said renewable energy is more than a third of IFC's infrastructure portfolio in India and is set to grow.

"In FY15, IFC has mobilised over \$330 million including loans and equity from other investors for renewable energy projects in India," Bose said. The global lending agency invested \$600 million to \$700 million

in Indian infrastructure last fiscal year, Bose said. "In the power sector in India, renewables is going to be the bulk of what IFC does."

While India's power sector is still largely based on coal, the country has been making a significant push in renewables, particularly solar.

In August it was announced that Indian companies are bidding on 750 MW of solar power projects as part of a government-funded support programme in the western states of Maharashtra and Gujarat. Contracts will be awarded in three months.

The bids are part of the second phase of the National Solar Mission through which capacity of at least 2 GW will

be auctioned with INR21 billion (\$322 million) of government-funded support.

India's renewable efforts were given a further boost last month with the approval of two major deals on renewable energy collaboration with France and Mongolia.

The agreement covers technical co-operation, which may include sharing of expertise between universities and technical institutions.

Most notably, Agence Française de Développement (AFD) has committed to a credit line of €1 billion over the next three years for the development of clean energy projects in the country.

Australia criticised over climate change ambition

Australia's plan to cut carbon emissions by 26-28 per cent by 2030 from 2005 levels has come under heavy criticism.

Environmental groups and energy experts say the target submitted to the UN as an Intended Nationally Determined Contribution (INDC) is not ambitious enough and falls short of those put forward by the United States and Europe.

Defending the decision to set a target seen as being near the lower end of pledges made by developed nations, Prime Minister Tony Abbot said the government needed to be environmentally and economically responsible.

"The last thing we want to do is

strengthen the environment and at the same time damage our economy. We are not leading but we certainly aren't lagging," he said.

In a statement Kelly O'Shanassy, head of the Australian Conservation Foundation (ACF), said: "It's a defeatist target that shows no faith in the ability of Australians to adapt, innovate and make the transition to a clean economy."

The Climate Change Authority, the government's independent body of experts, said in July that the country needs to cut emissions by 40 to 60 per cent by 2030 compared to 2000 levels to be in line with the UN's plan to limit global warming.

Laos aims to boost strategic energy credentials

Laos is moving closer to its dream of becoming the battery of Asia, with the signing of an agreement between Thai renewable company Impact Energy Asia and the Lao government to build the largest wind farm in Asean.

The 600 MW wind farm in southern Laos will cover two districts: Dak Cheung in Sekong province and Sanxay in Attapeu province. The wind project, known as Monsoon Wind, will be turned over to the Lao government after a 25-year concession.

About 95 per cent of the power is expected to be sold to Asean markets, mainly to Thailand and buyers bordering the Mekong. The project is also critical to Thailand's energy needs.

The project will also play a key role

in the Asean Power Grid Policy to sell power from Laos via the Thai and Malaysian grids to Singapore, which has pledged to buy Lao power to assist one of the poorer members in the group.

Laos is also developing its hydro resources in order to power export. Since the start of this year through July, the Lao government has allowed local and overseas companies to invest in 357 hydropower development projects with an expected generating capacity of 26 147 MW.

Earlier this year the Thai government confirmed it would purchase electricity from Laos according to the contract with the government of Laos, amounting to 7000 MW for 25 years beginning in 2016.

Indonesia continues renewables focus

Indonesia continued to demonstrate its renewable energy ambitions as state-owned electricity firm Perusahaan Listrik Negara (PLN), approved a power purchase agreement for 622 MW from independent renewable energy power plants worth \$1.71 billion.

PLN signed the agreement with five plants. The bulk of the power will come from the 510 MW Batang Toru hydropower plant in North Sumatra developed by North Sumatra Hydro Energy.

Adi Supriono, PLN's corporate secretary, said in a statement: "This is simply evidence of PLN's commitment to support the government's policy to develop renewable energy."

Adi said the deal would help boost PLN's commitment in supplying electricity from renewable energy sources to 5014 MW. PLN expects to purchase up to 4116 MW of new renewable energy by 2019.

Indonesia is working to add new capacity in an effort to avoid blackouts in the near future. Numerous geothermal power plant projects are included in the government's ambitious programme to develop 35 000 MW of

new capacity within five years.

State-owned oil and gas firm Pertamina recently said it expects its subsidiary to start adding electricity capacity from geothermal power plants in August next year. Pertamina, through subsidiary Pertamina Geothermal Energy (PGE), aims to see the completion of its 2x55 MW Ulubelu geothermal power plant units 3 and 4 in Lampung in August 2016 and June 2017, respectively.

Indonesia further evidenced its renewables ambitions last month with a pledge to provide incentives, including import-tax reduction, in an effort to increase investment in renewable energy projects.

According to *The Jakarta Post*, Indonesian Energy and Mineral Resources Minister, Sudirman Said, announced new regulations that would help create new investment opportunities for the development of the renewable energy sector.

"We need regulations that give more opportunities for investment, such as the elimination of import taxes for capital goods used for developing new and renewable energy," Sudirman was quoted as saying.

UK fast-tracks fracking



- Planning proposals to give developers certainty
- Government accused of double standards

Siân Crampsie

The UK government is renewing its drive to develop shale gas resources in order to boost energy security.

The country's Oil & Gas Authority (OGA) has awarded 27 licenses for the exploration of onshore oil and gas reserves while the Department of Energy and Climate Change (DECC) said that it will also fast-track the consent process for shale gas projects.

The exploration licenses cover 2700 km² of land and were awarded to oil and gas companies under the 14th onshore licensing round. OGA said that it has received almost 100 applications for the blocks and that it would offer a further round of licenses later this year after environmental assessments had taken place.

Companies that are awarded the licenses for shale gas exploration should benefit from a new, dedicated planning process under which applications for consent could be determined by government ministers if local authorities fail to make swift decisions.

The developments will add momentum to the UK government's drive to develop a shale gas industry, which, it says, will boost economic growth and improve energy security as North Sea reserves decline. "We need more secure, home grown energy supplies – and shale gas must play a part in that," said Energy and Climate Change Secretary Amber Rudd.

Rudd added: "To ensure we get this industry up and running we can't have

a planning system that sees applications dragged out for months, or even years on end. We now need, above all else, a system that delivers timely planning decisions and works effectively for local people and developers."

The licenses and proposed changes to planning were welcomed by the oil and gas sector. UKOOG, the representative body for the UK's onshore oil and gas sector welcomed the fact "that shale is to be treated as a national priority". Its CEO, Ken Cronin, said: "Recent experience has shown that the planning process is unwieldy and the time taken for planning decisions has soared from three months to over a year, causing delay and cost."

"It is right that the government is acting to ensure that local people can have their say and that the highest standards of safety and environmental protection are met, but also ensuring that the planning process itself is fit for purpose."

The government's proposed new measures include identifying councils that repeatedly fail to determine oil and gas applications within the statutory 16-week timeframe, and "calling-in" planning applications for shale gas projects on a case-by-case basis for determination by the Communities Secretary. Called-in projects and appeals involving shale gas applications will be prioritised by the Planning Inspectorate, said DECC.

The plans have been widely criticised by environmental groups, who have accused the government of double standards. "The same government that

is intent on driving through fracking at whatever cost has just given more powers to local councils to oppose wind farms, the cheapest source of clean energy," said Daisy Sands, Greenpeace head of energy campaign.

Greenpeace also warned that "hundreds of battles will spring up to defend our rural landscapes from the pollution, noise and drilling rigs that come with fracking".

The government believes that investment in shale could reach £33 billion and support 64 000 jobs. However, analysts have pointed out that the scale of the UK's shale resources has not yet been confirmed.

"As far as the shale gas debate in the UK is concerned we are now in a Catch-22: only an exploratory drilling programme can answer the questions that remain about the scale of the commercial opportunity, its environmental impacts and the effectiveness of the regulatory regime to mitigate those risks," said Michael Bradshaw, a Professor of Global Energy at Warwick Business School. "However, planners seem reluctant to grant planning permission because of the lack of a UK evidence base in terms of environmental impacts and their mitigation."

"In the current context of a highly polarized debate there is a need to press the reset button to gain a consensus for a programme of exploratory drilling to provide the evidence that is needed to make an informed decision. Simply telling everyone to hurry up may prove counter-productive in seeking a 'social licence to frack'."

Fortum takes stake in Hanhikivi 1

Finland's Fennovoima is to move forward with the development of the Hanhikivi 1 nuclear power plant after receiving financial support from three domestic companies.

Fortum, SRV and Outokumpu have assured Fennovoima that they will participate in the nuclear project either by taking new shares or increasing their existing stakes in Voimaosakeyhtiö SF, Fennovoima's main shareholder.

The move means that domestic ownership of Fennovoima now exceeds 65 per cent, allowing the construction license application for Hanhikivi 1 to proceed. Fortum will take a 6.6 per cent

stake and on the same terms and conditions as the other Finnish companies currently participating in the project. "Fennovoima is an important project for the Finnish society," said Fortum Interim CEO and CFO Timo Karttinen. "At the same time, nuclear power is one of the key areas in Fortum's strategy and our core competence together with hydropower and combined heat and power production."

Construction and project management company SRV has agreed to take a 1.8 per cent stake in the Fennovoima project, while stainless steelmaker Outokumpu will increase its share from 12.3 per cent to 14.1 per cent.

Oceade reaches milestone

- Alstom working towards certification
- France approves transition bill

Development of a tidal energy turbine by Alstom is making progress, the French firm has said.

The company has been selected to supply four of its Oceade 18-1.4 MW tidal turbines to one of the world's first tidal stream arrays in France.

Last month it announced that DNV GL, the independent energy certification specialist, has issued a 'statement of feasibility' to the Oceade.

The statement represents the first major milestone towards full certification against the industry recognised DNV-OSS-312 standard. DNV GL will now work with Alstom to review and approve design documents before heading towards the fabrication stage, including manufacturing quality and equipment testing and surveillance of the installation and commissioning.

Final Prototype Certification of the turbine will follow the successful

close-out of the actions agreed during the Statement of Feasibility stage.

Alongside the UK, France is leading development of the international tidal sector. The Alstom pilot project at Raz Blanchard, west of the Cotentin peninsula, is due to start operating in 2017 and will operate for 20 years.

In August France approved a historic energy transition bill that will reduce the country's reliance on nuclear energy, increase renewable energy production and improve energy efficiency.

The country's National Assembly approved the bill, which will pave the way for a reduction in the share of nuclear energy in the power generation mix to 50 per cent by 2025.

It also outlines a 40 per cent reduction in greenhouse gas emissions by 2030, compared with 1990 levels and a halving of overall energy consumption by 2050, compared with 2012.



The Alstom pilot project at Raz Blanchard is due to start operating in 2017 and will operate for 20 years

Further cuts proposed to UK solar



The UK's renewable energy sector "has been left reeling"

The UK's renewable energy sector says it has been left "reeling" after the government announced a review of subsidies for small-scale renewable energy schemes that could see feed-in tariff (FiTs) rates slashed by up to 86 per cent.

The UK's FiT scheme supports renewable energy schemes of up to 5 MW in size and has been successful in encouraging growth, particularly in the onshore wind and domestic solar sectors.

However the Department of Energy

and Climate Change (DECC) says that it is required under EU state aid rules to review the FiT scheme every three years.


DECC is also concerned about overspend on the Levy Control Framework, the government budget for renewable energy subsidies.

The proposals set out by DECC will see tariff rates for domestic schemes (now up to 10 kW) cut from 12.9 p/kWh today to 1.63 p/kWh next January. Larger schemes (10-50 kW) will have support cut from 11.30 p/kWh

to 3.69 p/kWh, while 50-250 kW schemes will be cut from 5.94 p/kWh to 2.28 p/kWh.

DECC is also proposing that FiT support falls to zero for domestic and standalone installations by 2019, and changes to the digression thresholds of the scheme.

The UK's Solar Trade Association said it was "astonished at how self-defeating" the proposals are and said it would continue lobbying government for a "stable glide path to subsidy-free solar".



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Kenya targets sustainable electrification

■ \$2.2 billion solar investment ■ GHG gas pledge submitted to UN

Siân Crampsie

A landmark agreement with a major international solar power project developer will help Kenya to meet its electrification goals, the country's Ministry of Energy and Petroleum has said.

The country has signed up SkyPower to build 1 GW of solar photovoltaic (PV) capacity in four phases across the country over the next five years. The \$2.2 billion agreement was signed in Nairobi at the sixth annual Global Entrepreneurship Summit (GES), an initiative started by the US government in 2010.

"We are very pleased to work with a world-leader in solar energy like SkyPower," said Henry Rotich, Cabinet Secretary of the Kenyan Ministry of Energy and Petroleum.

"Sustainable electrification is a central policy issue in Kenya, and we are committed to making this a reality for our citizens, while accelerating economic growth in the process," he added.

The SkyPower deal includes 200 MW of fabrication and assembly facilities, as well as a commitment of \$173 million toward education, training, and research and development. The project will create more than 25 000 total job-years, said SkyPower's Executive Vice President Charles Cohen.

In addition, SkyPower has agreed to gift two million solar kits to homes and working families across Kenya that are currently without access to electricity. The portable home kits include a solar panel and an inverter together with LED bulbs, a fan, USB

charging capabilities and a radio.

"We are delighted to work with the Kenyan government in the rapid implementation of this micro-electrification initiative that will help millions of people," said Cohen.

Kenya is realising rapid growth as the largest economy in East Africa. The country has pledged to cut carbon emissions by 30 per cent below business as usual levels by 2030.

In a submission to the UN in July, Kenya said it would meet the climate target by expanding solar, wind and geothermal power, and that it would also bring forest cover up to ten per cent of the country while reducing reliance on wood fuel.

It estimates that it will need \$40 billion over the next 15 years, some of it in the form of foreign aid, to implement its plans.

KACST collaboration boosts solar growth

Saudi Arabia will see development of its first 50 MW standalone solar power plant after the King Abdul Aziz City for Science and Technology (KACST) signed a memorandum of understanding.

Taqnia Energy will design, build, operate and maintain the Layla solar plant in collaboration with the Saudi Electricity Co. (SEC) at Al-Khafji. SEC will buy all of the energy generated at an unsubsidised tariff starting with 18.75 halala per kWh (5 ¢/kWh).

KACST has also signed a separate agreement with SEC to establish a joint research and development centre at the SEC distribution sector. It said that the agreements would help Saudi Arabia to build a sustainable future by engaging science, research and energy-related industries in reducing the cost of generating electricity through solar energy.

The deals would also help the country to build its solar energy industry, it said.

According to the Saudi government, the country's electricity sector needs an estimated SR700 billion (\$186.6 billion) in investments in the next 10 years in order to meet growing demand.

To help with the implementation of key projects, SEC has established an engineering company called SEC for Projects Development.

According to Saleh bin Hussain Al-Awaji, deputy minister for water and electricity and chairman of SEC, the new subsidiary will undertake design and management of projects, supervise implementation works and train SEC employees.

This approach will enable SEC to reduce its reliance on independent consultants.

MPC signs Musandam agreements

Development of a 120 MW independent power plant in Oman has progressed with the signing of a number of new agreements.

The 120 MW Musandam power project is being built in Tibat by Musandam Power Company (MPC) and will make a significant contribution to Oman's efforts to boost generating capacity.

In August MPC said it had executed a long-term power purchase

agreement (PPA) with Oman Power and Water Procurement Company and a natural gas sales agreement with the Ministry of Oil and Gas for the supply of natural gas to the new plant.

MPC has also signed project financing agreements and achieved financial close with Bank Muscat.

Isam al Zadjali, Chief Executive Officer of OOC, said: "The second phase of the project, i.e., the issuance of notice to proceed to the EPC contractor and

construction work of the Musandam IPP started in advance of the signing of the power purchase agreement and project financing agreements in order to accelerate the pace of work and the establishment of the plant according to the completion schedule."

The Musandam IPP will use clean natural gas as the main fuel to maintain the stability of the local electricity supply and support sustainable development in the Musandam Governorate

while significantly contributing to the Sultanate's energy production capabilities and long-term economic diversification plans.

Storage diesel fuel will be used during emergencies as the alternate fuel for the new power plant. The electricity generated from this project will be transmitted to the existing medium voltage grid through a new 132 kV transmission lines being built by Rural Area Electricity Company. The

electricity generated will serve the power demand of the Musandam Governorate.

EPC for the power plant will be undertaken by Wärtsilä, which will design, procure, engineer, construct, and commission the power plant as well as provide ongoing maintenance and performance monitoring throughout the project's lifecycle. The plant is expected to be commissioned by end of 2016.

Kuwait approves infrastructure projects

Almost \$10 billion is set to be invested in Kuwait after the country approved the construction of a series of power plants, desalination facilities and other infrastructure projects.

Like neighbouring Gulf countries, Kuwait is struggling to meet soaring demand for electricity and the planned projects will add around 3580 MW of capacity, as well as waste treatment and developments for the education ministry.

A timetable for the developments has not yet been set, according to the Finance Ministry, which said that 50 per cent of the finance would be raised through stock market offerings.

The projects include a second phase of the 1800 MW gas-fired Az-Zour North power and desalinated water plant. It will also build the first phase of the 1500 MW Khairan power plant, and the 280 MW solar-gas hybrid Al Abdaliyah power plant.

Kuwait plans to generate 15 per cent of its energy needs via renewable sources by 2030, with the first of up to 100 solar-powered fuelling stations operating by 2017, oil minister Ali Saleh al-Omair said in June.

A pilot 70 MW solar project in the Shagaya desert zone west of Kuwait City is expected to be completed by next year.



Soaring demand: Kuwait City

Hydro plants bundled for privatisation

Turkey's Privatization Administration (ÖİB) has opened tenders for the privatisation of a total of ten hydropower plants, the *Official Gazette* said on 29 July 2015.

The power plants will be privatised in groups. The bid security for the first group of power plants, Karacaören 1 and 2, was set at TRY25 million (\$8.55 million); for the second group, Kepez 2 and Manavgat, at TRY20 million; for the third group, Fethiye, at

TRY10 million; for the fourth group, Kadıncık 1 and 2, at TRY30 million; and for the fifth group, Doğakent, Kürtün and Torul, at TRY50 million. Deadlines for bids are October 5, 2015 to November 20, 2015.

Elsewhere in Turkey, Akça Enerji has opened a 270 MW power plant that will utilise local coal resources.

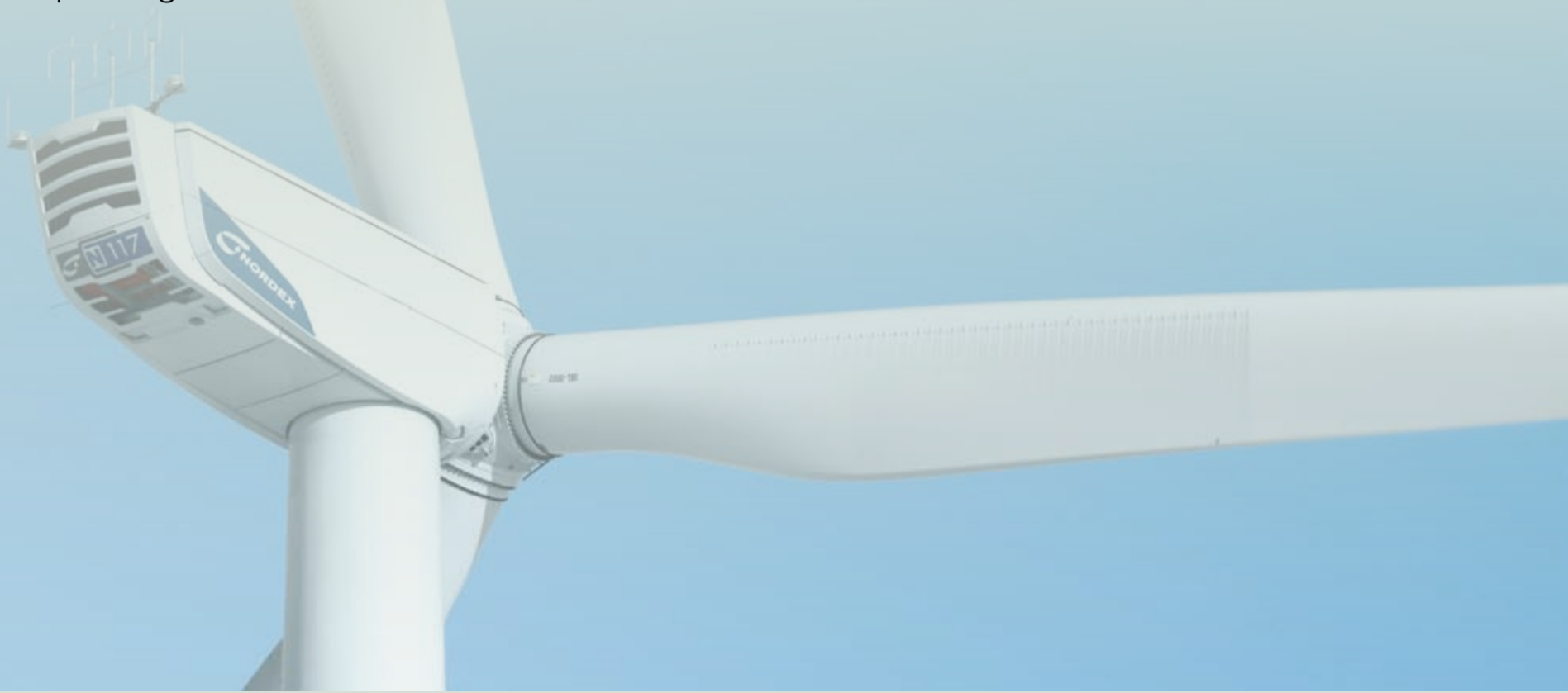
Located in the Black Sea province of Bolu, the new plant will meet one per cent of Turkey's total energy needs.

The power plant marks Turkey's first coal royalty investment since the Coal Operators' Board (TKİ) opened up lignite coal fields to the private sector, Akça also said.

"The power plant will contribute to the Turkish economy by decreasing the energy dependency on foreign sources. The Göynük Power Plant will create 1000 new direct and indirect jobs," said Akça Enerji Chairman Cemil Kazancı.

Putting a strong wind behind South Africa's recovery

The first turbines at the Amakhala Emoyeni Phase 1 wind farm have been erected. The project represents one of the most important renewable energy projects that are spearheading South Africa's fight to keep the lights on. **Junior Isles**



Years of under-investment has left South Africa's power generation sector creaking at the seams. In the face of the worst power shortages the country has seen in six years, in December last year the government set up a 'war room' to oversee the implementation of a five-point plan to tackle the deepening crisis.

Part of that plan will see the acceleration and expansion of a renewable energy programme designed to bring on new capacity developed by the private sector. The programme will not only ease constraints on the electricity sector and the economy but will also address climate change and reduce emissions.

With a number of projects completed and many more either under construction or in the planning phase, wind energy is proving to be an important part of the programme. One of the largest projects being built under the programme recently achieved a major milestone.

Erection of the first batch of turbines of the Amakhala Emoyeni Phase 1 Wind Farm, located near Bedford in the Eastern Cape Province, is now complete. The wind farm will use 56 Nordex N117/2400 for a total generating capacity of 134.4 MW and is expected to offset approximately 445 152 t of CO₂ a year.

Commenting on the growing importance of wind power to the country, Anne Henschel, Country Manager Nordex Energy South Africa RF (Pty) Ltd, said: "The situation in the energy sector is quite tense given the periodic load shedding, which obviously affects the economy.

"This is where renewables can really make a change to the short-term

perspective. We are thankful that the government, especially the Department of Trade and Industry and the Department of Energy realised that the industry can – in a relatively short period, i.e. 12-18 months – deliver wind and solar plants of 100-150 MW. It's not significant volumes, but it is adding much needed capacity to the national grid."

Amakhala Emoyeni Phase 1 will be a significant addition to the approximately 1000 MW of wind energy capacity currently installed in South Africa.

The project kicked off nearly four years ago when Windlab partnered with Cennergi, a joint venture between Exxaro and India's Tata Power Company, in December 2011 to prepare a successful bid in South Africa's Renewable Energy Independent Power Producer's Procurement Programme (REIPPPP). Amakhala Emoyeni Phase 1 was bid in the second round of the REIPPPP in March 2012 and was announced as a preferred bidder on May 21. It is one of the 19 renewable energy and seven wind projects selected under the second round of the REIPPPP.

The Amakhala Emoyeni Phase 1 project signed a 20-year Power Purchase Agreement with South Africa's national utility Eskom and an implementation agreement with the Department of Energy in May 2013. Financial close for the project was achieved in May 2013. The project is estimated to cost approximately R3945 million (\$306 million), which will be funded through a debt-equity mix of 80:20. Cennergi is the sole provider of the entire equity for the project.

Following financial close, the

contract to build the wind farm was officially signed between Nordex and Cennergi and the project formally kicked off with the Notice to Proceed two weeks after contract signing.

According to Nordex, its solid financial standing and the reputation of its technology were key factors in it being selected to supply and install the turbines.

The N117/2400 turbines are also well suited to the site conditions. The N117/2400 has been specially developed for low-wind sites.

With a rotor diameter of 117 m and a swept area of 10 715 m², the N117/2400 is one of the most efficient IEC 3 turbines in its class. According to Nordex, in typical low-wind regions, it will achieve over 3500 full-load hours, thus exceeding other turbines in this category by 20 per cent. This translates into a capacity factor of 40 per cent, allowing operators to achieve high and steady electricity production in regions characterised by lighter winds.

Henschel added: "Although the 7 m/s wind speed at the site is not that low, the power curve, i.e. the amount of power produced and the capacity factor are so good we convinced Cennergi to go for this option."

Selecting the right turbine for a wind corridor is crucial and conditions such as wind speed and elevation have to be considered carefully. "We carried out studies and made numerous calculations," said Henschel. "The N117/2400 turbine was the most suitable at the time and could provide the required return on investment. In fact the turbine was named as the most efficient IEC3 turbine on the market in 2011."

Although the wind farm will not be close to a heavily populated area, the acoustic power level is a maximum 105 dB, thus allowing the turbine to be used closer to residential areas. The N117/2400 has also been designed with construction height limits in mind. The towers at Amakhala Emoyeni Phase 1 are of the standard Nordex design, each made of modular tubular steel with a height of 91 m.

The N117/2400 is the result of 11 years of systematic ongoing technical enhancements to the multi-megawatt platform, 26 years of wind power engineering and experience gained from over 1300 installed multi-megawatt wind power systems.

The rotor consists of three rotor blades made of high-quality glass fibre-reinforced polyester, a hub, slewing rings and drives for adjusting the rotor blades. A pitch system is used to control and optimise output. The variable-speed rotor enhances the aerodynamic effects and reduces the wind load on the system. If necessary, each rotor blade can be locked in any position by means of an innovative locking system to facilitate servicing.

The three redundant and independently controlled rotor blades can be set at full right angles to the rotation direction for aerodynamic braking. In addition, the hydraulic disc brake provides additional support in the event of an emergency stop.

The wind turbine has two anemometers. One anemometer is used for controlling the turbine, the second for monitoring the first. All operational data can be monitored and checked on a control screen located in the switch cabinet or via an external laptop. The

Special Project Supplement



Blade production: blades are made of high-quality glass fibre-reinforced polyester. Source: Nordex SE

data and signals are transmitted via ISDN for remote monitoring and the operator can download all key data for the turbine from the internet. The necessary communications software and hardware is supplied by Nordex.

The drive train consists of the rotor shaft, the gearbox, an elastic coupling and the generator.

Nordex equips the turbines with a two-stage planetary gearbox with a spur gear stage or with a differential gearbox. The gearbox is fitted with a cooling circuit with variable cooling output. The gearbox bearing and tooth engagement are kept continuously lubricated with oil.

The generator is a double-fed asynchronous machine. Nordex has been using this type of generator with variable-speed turbines successfully for many years. The main advantage is that only 25-30 per cent of the energy produced needs to be fed into the electricity grid via a frequency converter. The deployment of this generator/frequency converter system thus cuts the total cost of the wind power system.

The gearbox, generator and converter of the turbine each have independent active cooling systems. The cooling system for the generator and frequency converter is based on a cooling water circuit, while the gearbox is cooled by an oil-based system. This ensures optimum operating conditions in all types of weather. A separate cooling system room at the rear of the nacelle facilitates access to the cooling units and ensures optimum performance of the individual systems.

The nacelle consists of the cast machine frame, a welded generator frame, a steel structure for the crane system and for supporting the nacelle housing and the nacelle housing itself, which is made of glass fibre-reinforced plastic. Ergonomically

designed, it is spacious and thus service-friendly.

The nacelle features two redundant wind direction sensors to continuously monitor wind direction. If the permissible deviation is exceeded, the nacelle yaw is actively adjusted by means of up to four geared motors.

When installing the machines, care has to be taken to ensure the blades and yaw are used in the most optimum way for energy production.

As the turnkey contractor for the project, in addition to the supply of the turbines, Nordex is responsible for the supply of civil and electrical works (through subcontracts), installation and commissioning of the turbines and connecting them to the grid.

As of mid-August this year, nine of the 56 turbines had been installed and pre-commissioning was about to begin. The plan is for 33 turbines to be erected by the end of this year, by which time it is hoped that the grid connection being handled by Eskom will be ready. The entire wind farm is expected to be complete and feeding into the national grid some time in June 2016.

In the meantime, the onsite 132 kV substation being built at Kopleegte is under construction, civil works are ongoing and foundations are almost ready.

The erection and installation of this many turbines is a challenging task. Amakhala Emoyeni Phase I is part of the greater Amakhala Emoyeni project concept, which will eventually cover a 27 000 hectare area.

Henschel noted: "It's a huge wind farm; you need to drive for an hour to get from one side to the other. I have been in the business for 15 years but have never seen such a big wind farm."

Initial works include the construction of 35 km of internal roads for the

installation of the wind farm and future operations.

For such a spread-out site it is crucial to organise work well. For example, the flow of components coming in has to be well organised. Nordex also has to optimise both the usage of the crane and the installation process to maximise efficiency in its work.

The company started erection work in June this year with what Henschel calls its "golden turbines", which are essentially its benchmark units. She said: "We can go back to these turbines to compare the quality of components coming from the port. If, for example, we find there's a problem with a nacelle, we can do the repair work before installing it. This also means that when the turbine is installed, it can be easily commissioned and connected to the grid."

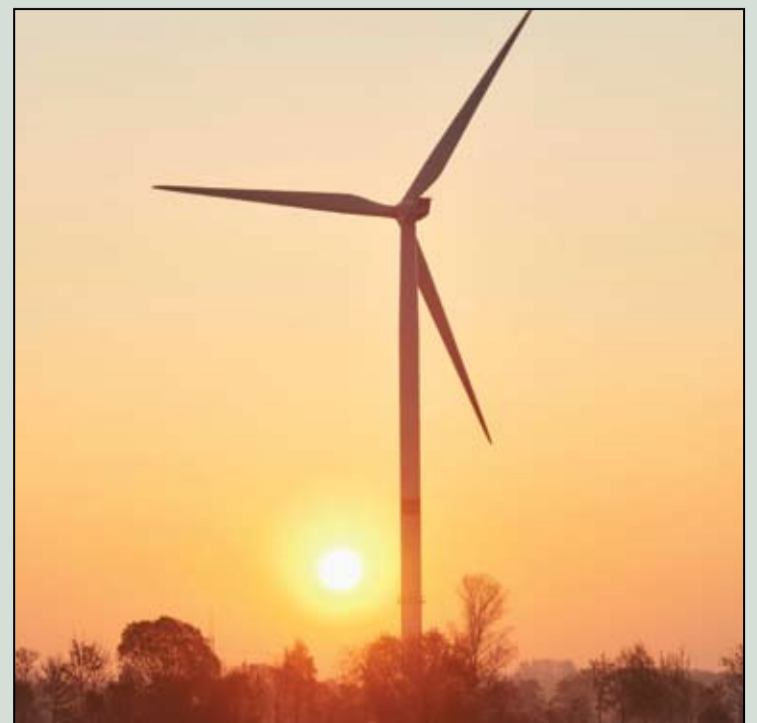
One special installation technique being used is a "star-lift", wherein all three blades are assembled at the base of the tower and the whole "star" is lifted to the top of the tower and connected to the nacelle.

The wind farm is located south of the towns of Cookhouse and Bedford in an area that is lightly populated yet close to good infrastructure such as roads and the national electricity grid. With large components having to be transported close to these communities, maintaining healthy community relations during project construction is important.

Managing all the stakeholders, as well as ensuring the safety of all of those involved in working on such a huge project, is a challenging task.

"We are focusing on motivating the team to work safely," said Henschel. "Every morning we organise the work and always instruct people to look for, and make us aware of, unsafe conditions. The health and safety of our employees, our subcontractor employees and the communities in and around the areas where we work, as well as the protection of the natural environment, are key priorities in our operations. You cannot damage the environment. You also have to conduct various risk assessments and implement processes to avoid incidents, which have the potential of a major impact on the project timeline and the health and safety of employees and subcontractor employees."

Following the successful construction and commissioning of the project, Nordex will service and maintain the turbines under a 10-year maintenance contract. This will be a 'Premium Contract' under which Nordex will



provide full maintenance and repair of any damage to the turbine.

"The contract gives the client the confidence that the turbines will run and meet a specified availability over the 10 years," said Henschel.

When it is up and running the project will not only add capacity to the national electricity grid, it will also support local social and economic activities. Further, it will support education and skills development through participation of those communities in the wind farm through a Community Trust, which holds 5 per cent shareholding in the project.

In South Africa, projects are required to have a certain amount of local content. This has so far been largely in the form of installation and crane work, civil and electrical work, as well as the delivery of electrical components.

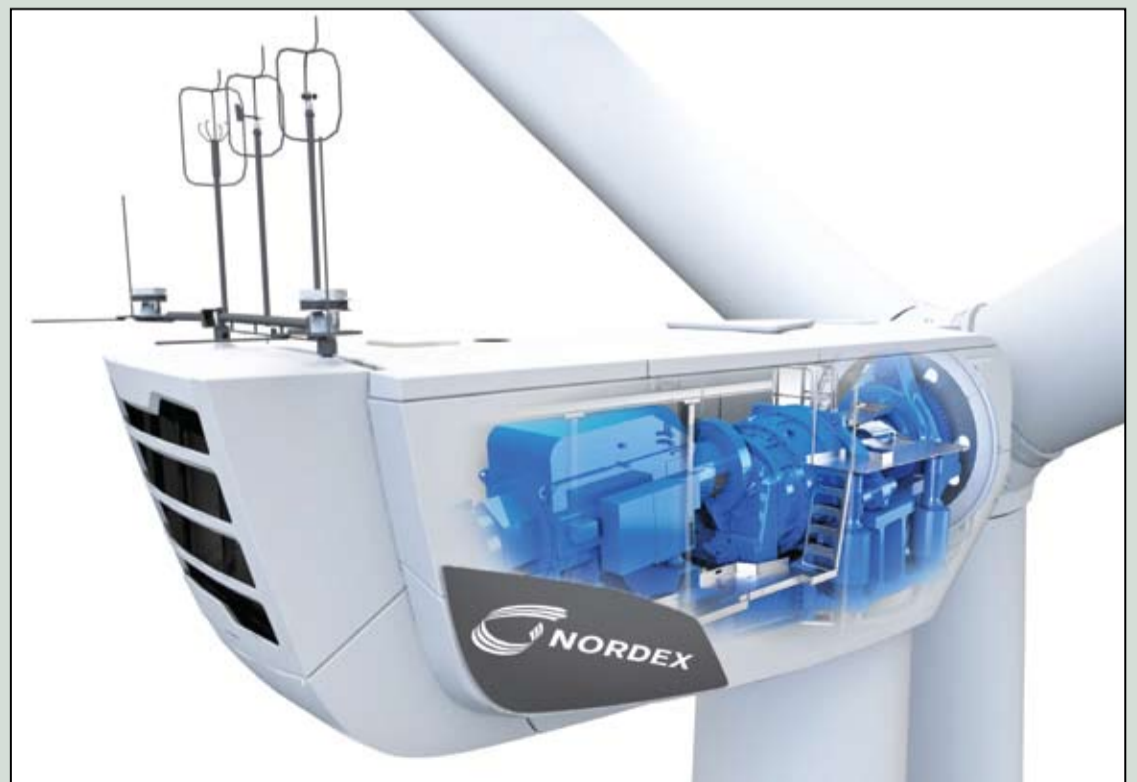
The plan is also to have a number of turbine towers produced locally. However, as the local supply chain is in its infancy and there is pressure to move the project along quickly, the first set of towers has been produced in Asia, while the blades have come from a supplier in Turkey. The nacelles are being produced in the Nordex production facility in Rostock, Germany.

Henschel commented: "There has to be a certain percentage of local

Nordex N117/2400: 56 wind turbines will produce 134.4 MW at Amakhala Emoyeni Phase 1.

Source: Nordex SE

3D image of the N117/2400 nacelle. Source: Nordex SE



Special Project Supplement



Installation: all three blades are assembled at the base of the tower and the whole “star” is lifted to the top of the tower and connected to the nacelle.

Source: Nordex SE

content and Nordex is keen to support local production. We have supported one local turbine supplier but when they experienced challenges in meeting the delivery schedule, we approached the Department of Energy for a partial waiver of the local content commitment.

“They agreed that it was not possible to have all the towers locally produced at this stage and so waived the requirement for locally produced towers just for this round.

“The government has been quite flexible in ensuring that local suppliers are supported and strengthened while allowing the project to meet its schedule. When there is an energy crisis, the timeline is the most important thing.”

Meanwhile, Henschel says Nordex has had good cooperation with its construction subcontractors and has transferred its knowledge on foundation design so it meets the Nordex standards.

There is no disputing the importance of Amakhala Emoyeni Phase I to the country as a whole, the local community and to Nordex.

As Henschel pointed out: “This is a very important project for Nordex in South Africa and the entire Nordex Group. When we signed the contract in May 2013, at 56 turbines it was the biggest project the company had ever had. Since then one has been signed for 59 turbines in Uruguay, but Amakhala is the biggest for our local company.”

The project adds to the experience and lessons learnt from Nordex’s two other projects in South Africa – the 80 MW Kouga project and 100 MW Dorper wind farm.

These projects combined with the award in March of a firmly financed

Amakhala Emoyeni project overview

Location	Near Bedford in the Eastern Cape Province, South Africa
Land type	The 27 000 ha area is predominantly used for grazing
Total generation capacity	Up to 750 MW in phases, the first phase being 134.4 MW
Turbines	Phase 1: 56 x 2.4 MW Nordex N117/2400
Current status	Phase 1 under construction

Wind turbine specifications

N117/2400	IEC 3a
Operating data	
Rated power (MW)	2400
Cut-in wind speed (m/s)	3
Cut-out wind speed (m/s)	20
Rotor	
Diameter (m)	116.8
Swept area (m ²)	10 715
Operating range rotational speed (rpm)	7.5–13.2
Rated rotational speed (rpm)	11.8
Tip speed (m/s)	72
Speed control	Variable via microprocessor
Overspeed control	Pitch angle
Gearbox	
Type	3-stage gearbox (planetary-planetary-spur gear) or 4-stage gearbox (planetary-planetary-differential-spur gear)
Generator	
Construction	Double-fed asynchronous generator
Cooling system	Liquid/air cooling
Voltage (V)	660
Grid frequency (Hz)	50/60
Control	
Control centre	PLC controlled
Grid connection	Via IGBT converter
Distance control	Remote-controlled surveillance system
Brake system	
Main brake	Aerodynamic brake (Pitch)
Holding brake	Disk brake
Tower	
Construction	Tubular steel tower
Tower height (m)	91

The Nordex production facility in Rostock, Germany, where the nacelles will be produced.

Source Nordex SE



order for turbines to be installed at a project with capacity of 111 MW, means Nordex has secured a total of 425.4 MW, equivalent to around 20 per cent of the total of 1983 MW allocated in the first three Rounds of the REIPPPP.

Notably, this most recent order is located in the Eastern Cape of the country and will have 37 N117/3000 turbines, making it the first one in South Africa to be fitted with Generation Delta turbines.

The projects have helped Nordex Energy South Africa RF (Pty) Ltd optimise its whole project development process.

The company has trained employees

in project management, site management and has transferred knowledge to its sub-contractors Conco, Actom and Power Construction.

Commenting on Nordex’s activities in the country, Henschel said: “We have been here since September 2012, so we are celebrating three years in the country and 30 years in the business.”

“There are now nearly 50 employees in the organisation, which is very multi-cultural – we have many different local languages and five experts from Europe. We are very proud to have a highly motivated and competent team.

“The company is 20 per cent black-owned through the Nordex Education Trust, a broad based black economic empowerment scheme, which supports many social projects with the focus on education and training.”

South Africa is one of the key markets for the Nordex Group, especially with the government’s recognition of the importance of renewables in the energy mix.

According to the Department of Energy, South Africa has significant renewables potential and presently has in place a target of 10 000 GWh of generation from renewable energy sources. The Minister has determined that 3725 MW is required from renewable energy sources to ensure the continued uninterrupted supply of electricity. This 3725 MW is broadly in accordance with the capacity allocated to renewable energy generation in IRP 2010-2030.

Although renewable energy accounted for less than 1 per cent of South Africa’s energy mix in 2012, this is expected to reach 12 per cent by 2020. According to Frost & Sullivan, this would place South Africa in the “global top 15 countries” with regard to the implementation of renewable energy projects.

“It’s a good business; it’s a good country and we are in the process of establishing a new industry,” said Henschel. “In Europe nearly 10 years were needed to build up the wind industry, but here we already have a successful business in just the third year.”

The price of power from wind has also been falling, which will make wind more competitive with other forms of generation. There has been a fall in the cost of electricity from wind farms from Rounds 1 to 3 of the REIPPPP. Henschel believes one reason is the falling cost of project financing, which is driving the IPP programme.

She added: “The big utilities are also coming into the market. They come up with cheaper financing solutions. That’s why the price is now between R60-70¢, making wind a competitive energy source in South Africa. This is even cheaper than coal, which is around R89-95¢.”

Business Day reported in November that the average price offered for power generated from wind – which received the bulk of the third-round allocation – had dropped from R11.43/kWh in the first round to R6.65/kWh in the third round.

This bodes well for the future of wind generation in South Africa. Historically the country has been dependent on coal and nuclear plants. While these are both energy sources that are good for large baseload generation, due to their long project execution time they can do little to ease the dire power supply situation.

Henschel concluded: “Nuclear plants are very expensive and take 10 years to build. Large coal fired power plants such as Medupi will be complete in the next one or two years but renewable energy could help solve the current energy crisis.”



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EDF, Areva agree on rescue deal

■ Firms "immune" from further Olkiluoto 3 losses
■ New CEO appointed for Areva NP

| Siân Crampsie

French nuclear giant Areva has agreed to sell a 75 per cent stake in its nuclear power plant business to EDF in a bid to overcome its financial woes.

The agreement follows months of negotiations and will mean a reshaping of the French nuclear technology industry, with EDF taking a lead role in the design and manufacturing of reactors and Areva becoming largely focused on the fuel cycle.

It will also please the French government, which orchestrated the deal in order to keep the country's nuclear sector in French hands.

The two state-owned companies have agreed that EDF will pay €2 billion for the majority stake in Areva NP, Areva's loss-making reactor unit. Areva will continue to mine, enrich and dispose of uranium fuel, and has also agreed long-term contracts with EDF to provide fuel and other services.

A final agreement on the deal will also result in a government-backed capital raising for Areva, which says that it needs a €7 billion capital injection over the next two years.

The company says that it could raise up to €0.4 billion through sell-offs of businesses such as Canberra, a nuclear measurements subsidiary.

Areva and EDF say they would also set up a dedicated company that would improve the design and management of new nuclear reactor projects. That company would be 80 per cent owned by EDF, which has also said that it could sell some of its Areva NP stake to third parties.

Last year Areva reported a €4.8 billion net loss after continuing problems in the reactor business, notably a dispute at the Olkiluoto 3 nuclear power plant project in Finland and a general downturn in the nuclear sector following the 2011 Fukushima disaster in Japan.

The Olkiluoto 3 project is several

year behind schedule and has resulted in €3.9 billion in impairment charges for Areva.

However, it is likely that the French government will now shield the firms from further charges related to Olkiluoto 3, as EDF said it would be "completely immunised" against further risks related to the reactor project.

At the end of July Areva reported a €206 million net loss for the six months to June 30, compared with a €488 million profit in the same period last year. Revenue rose six per cent to €1.9 billion.

It also announced that Bernard Fontana, a former member of the executive

committee of ArcelorMittal, will become President and Chief Executive Officer of Areva NP.

"We are targeting a clear objective for 2017: to transform Areva into a competitive company refocused on its core business, the nuclear fuel cycle, where it has unique human and industrial capital in the world," said Areva CEO Philippe Knoche in a statement. "The agreements found with EDF represent very significant progress."

Knoche added: "The arrival of Bernard Fontana, coming from the industry and internationally recognised, at the head of Areva NP, is... very good news for the group."

SkyPower JV targets Mexico

Solar energy firm SkyPower says it will develop a string of large-scale photovoltaic (PV) projects across Mexico through a new joint venture with Grupo Uribe.

The two companies plan to develop what they say will be the largest solar development company in Mexico, which is taking steps to attract private investment to its power sector to increase and diversify generating capacity.

SkyPower, the world's largest developer of solar PV plants, says that it will combine its project expertise

with Grupo Uribe's long-standing credible presence in the Mexican energy sector to "rapidly deploy its capital and resources in order to immediately execute on large-scale solar development opportunities".

"SkyPower is truly excited to be a part of this historical change in the energy sector for Mexico, which will undoubtedly create new jobs and stimulate economic growth and development in both rural and urban communities around the country," said Kerry Adler, President and Chief Executive Officer of SkyPower.



SkyPower and Grupo Uribe to develop "largest solar development company" in Mexico

Oil firms react to oil price drops

Major oil firms are adjusting to lower oil prices, which are expected to remain low for some time.

Royal Dutch Shell said it would cut 6500 jobs and reduce its capital spending budget by 20 per cent this year to adjust to the new commodities environment, which has seen crude oil prices fall from around \$115 per barrel 12 months ago to \$40 per barrel at present.

The company has also said that its planned takeover of BG Group is on track in spite of analyst concerns that it will not work in a low oil price environment.

The 6500 job losses include reductions already announced in its North Sea business, the USA, Canada, Norway and Nigeria, and include a cut in the number of contractor roles. It says that it will reduce investment by \$7 billion from last year's levels to about

\$30 billion in 2015, a bigger drop than forecast earlier this year and a sharper reduction in capital spending than many of its rivals.

Oil prices have fallen because of an oversupply in the market and a decision by Opec to maintain output. Low oil prices are "here to stay", said Sarosh Zaiwalla, an international sanctions lawyer and oil industry expert. "Oversupply is now becoming a very real problem for the market."

"Iran's re-entry will see the production of a further 1 million barrels of oil a day by next year. Furthermore, despite sanctions, Russian oil production is at an all-time high, supported by new explorations in the Arctic and an internalisation of the industry and its suppliers."

"Now we have a situation where the world's second biggest consumer of oil is undergoing a major slowdown

which, combined with a growing export oil industry in China, will inevitably lead to less crude being sold."

Shell reported in July that robust downstream performance had bolstered its earnings, which stood at \$3.8 billion in the three months to end-June, compared with \$6.1 billion for the same quarter last year.

Meanwhile BG Group's net income fell by 65 per cent from a year earlier to \$429 million in the second quarter. CEO Helge Lund said that the company was adapting to the low oil price environment with the help of efficiency programmes and higher output.

ExxonMobil has reported a 52 per cent fall in second quarter earnings in spite of an increase in production. It made a \$47 million net loss in its US upstream operations, while outside the USA, upstream earnings fell 69 per cent to \$2.08 billion.

E.On's Uniper takes shape

E.On says it is on track with its plan to split in two as it adjusts its business to changes in the electricity sector.

The German utility says that it has designed the organisational setup of the two entities, including the spin-off firm, Uniper, and has also selected personnel to fill the top management positions in each company.

"The spinoff will result in E.On focusing primarily on renewables, energy networks, and customer solutions,

Uniper on conventional energy businesses, global energy trading, and oil and gas production," said CEO Johannes Teyssen in August as the company presented its half-year results.

E.On reported that underlying net income fell 21 per cent to €1.2 billion in the first half of this year, though sales rose five per cent year-on-year to €57.3 billion, beating expectations.

Earnings from power generation declined following the sale of fossil

fuel power plants in Spain and the decommissioning of coal-fired plants in Germany.

E.On has also sold coal, gas, solar and hydropower plants in Italy. It expects 2015 earnings before interest, tax, depreciation and amortisation to be between €7 billion and €7.6 billion, and underlying net income for the year to be between €1.4 billion and €1.8 billion.

"Almost 2 GW of new and efficient

conventional generating capacity will enter service at E.On power stations in the Netherlands and Russia in the second half of the year, along with more than 500 MW of offshore wind power in the North Sea," said new E.On CFO Michael Sen. "This will have a positive effect in the quarters ahead. In addition, we plan to build two more large offshore wind farms, one off the UK coast, the other in the German Baltic Sea."

Teyssen added that managers at

E.On and Uniper were putting together their teams for their future departments. "In addition, we're gradually also involving outside entities, such as tax authorities and the auditor for the spinoff," he said.

Uniper will consist of E.On's conventional power plants, oil and gas operations and energy trading business, and will also assume €16.6 billion in nuclear provisions.

Uniper will start operating in 2016.

10 | Tenders, Bids & Contracts

Americas

Coachella orders GE storage solution

GE is to provide Coachella Energy Storage Partners (CESP) with a 30 MW battery energy storage system for a project in California's Imperial Valley.

The lithium-ion energy storage system will aid grid flexibility and increase reliability on the grid by providing solar ramping, frequency regulation, power balancing and black start capability for an adjacent gas turbine. It will consist of lithium ion batteries housed in a purpose-built enclosure with GE's Mark VI plant controls, Brilliance MW inverters, Prolec transformers and medium-voltage switchgear.

The plant will be operated by ZGlobal, an engineering collaborator with CESP, for the first 18 months, after which control will transfer to the Imperial Irrigation District (IID), CESP's client and operator of the network.

GE anticipates project construction will begin early next year, with commercial operation scheduled for the third quarter of 2016.

ABB wins Light contract

Brazilian electric power distributor Light Serviços de Eletricidade has placed an order with ABB for the provision of a protection and control system for Frei Caneca, its most important substation.

Built in 1907, the Frei Caneca substation supplies power to a population of about two million in downtown Rio de Janeiro and serves critical infrastructure in the area including the subway system as well as trains and communication networks. ABB's protection and control equipment will help to optimise the operation of the substation and enhance power reliability and stability.

ABB's scope of supply includes the latest version of its REB500 distributed busbar protection for 27 bays of the substation. IEC 61850 edition 2 compliant Intelligent Electronic Devices (IEDs) and Combi-Flex relays will enhance reliability and ensure power quality.

Hecate selects zinc-iron battery

ViZn Energy Systems Inc. (ViZn) has won a contract with Hecate Energy, a leading US-based developer of power projects, to supply a 2 MW zinc-iron redox flow battery system for the provision of ancillary services to the Ontario grid operated by the Independent Electricity System Operator (IESO).

ViZn Energy's 2 MW/6 MWh flow battery, which is scheduled to be commissioned in 2016, is on target to be the largest commissioned flow battery installation in North America and Europe to date.

ABB wins Xcel contract

Xcel Energy has placed an order with ABB for the delivery of two static var compensators (SVCs) to support its transmission grid expansion in New Mexico.

The SVCs, to be located at Xcel Energy's Roadrunner and China Draw substations, will provide the necessary dynamic voltage support for new loads that have been added to the 115 kV network in southeast New Mexico.

ABB's turnkey solution includes design, engineering, installation and commissioning of the two SVCs, each rated 115 kV. The project is scheduled to be completed in 2016.

Asia-Pacific

Siemens provides long-term service for Xiaoshan

Zhengjiang Zheneng Electric Power Co., Ltd. has awarded Siemens a long term service agreement for the Xiaoshan power plant in China.

The agreement covers scheduled maintenance, spare parts, technical support, warranties, programme management, power diagnostics and performance monitoring for the power plant's Unit No. 5 SGT5-4000F gas turbine for more than 10 years.

The agreement will enable Xiaoshan to take advantage of Siemens' programme management services, with dedicated professional service support via experts from Siemens district service office (DSO) in China and backed by Siemens resources worldwide.

Xiaoshan power plant is a subsidiary of Zhejiang Zheneng Electric Power Co., Ltd., and currently operates three SGT5-4000F gas turbines. Siemens was first awarded the LTP service contract for Units No. 3 and No. 4 in 2010.

With this order, Siemens Power Generation Services has been awarded 12 LTP contracts in China.

Emerson automates Shehong Liushu

Emerson Process Management is to automate the Shehong Liushu hydropower project in China after being awarded a project by Tuopai Power Development Co.

Emerson will provide its Ovation control and Scada technology to manage operations at the 3 x 16 MW power plant, which is being built in the Shehong region in southwest Sichuan.

Tuopai Power Development is among the first hydropower generators in China to adopt distributed control system technology that provides tighter overall control, enhanced diagnostics, improved plant efficiency, reliable grid synchronisation, enhanced cybersecurity and more efficient operator deployment.

Ovation technology will directly control primary plant equipment and processes, perform automatic voltage regulation, and manage information from the 24 spillways. Emerson will also supply its Rosemount pressure and level transmitters.

Siemens wins onshore wind order in Australia

Siemens and Neoen Australia have signed a contract for the supply of turbines for the Hornsdale wind farm project in the state of South Australia.

Siemens will supply 32 Siemens direct drive wind turbines as well as a long term service contract for the project, which will provide energy to the Australian Capital Territory (ACT) under a power purchase agreement.

Siemens will provide the full turnkey project solution including its SWT-3.2-113 wind turbines with associated civil and electrical infrastructure. Construction would start "immediately", Siemens said in last month (August).

Europe

Electricity North West protects grid

Schneider Electric has announced a contract to deliver a fault level assessment tool to Electricity North West in the UK.

The tool will be installed as part of a larger £5.5 million project being undertaken by Electricity North

West and will help the utility to future-proof its grid.

Intermittent energy sources and an anticipated growth in peak electricity demand are fuelling an increase in network fault level. When fault level goes above the capability of existing circuit breakers, substations and energy infrastructure are placed in real danger, unless actively managed.

The fault level assessment tool will deliver an intelligent approach to managing fault currents by processing complex network conditions and predictively adapting the network for anticipated faults.

Prysmian to supply Belwind 2 cables

Prysmian Group has been awarded contracts by Nobelwind NV, an offshore wind farm developer, to supply wind turbine inter-array cables for the Bligh Bank 2 (Belwind 2) offshore wind farm, located off the coast of Zeebrugge in Belgium.

Prysmian is responsible for the design, manufacture and supply of the 33 kV submarine cables with various cross-sections to be used to connect the 55 individual wind turbines and an offshore high voltage substation (OHVS) that form the 181.5 MW wind farm located near the existing OHVS of Belwind 1.

In addition, Prysmian will supply a 33 kV coupling cable for use as a back-up connection between the Belwind 1 OHVS and the Bligh Bank OHVS. Prysmian will also provide the offshore cable termination and testing services for the project.

The cables will be produced in Prysmian's facility in Drammen, Norway, one of the Group's excellence centres for submarine cables. Installation works are scheduled to be completed by the first half of 2017.

France calls for tidal and wave projects

The French Environment and Energy Management Agency (ADEME) has opened a tender for tidal and wave energy projects.

The call aims to finance wave, marine and river tidal, and technology demonstration projects. The tender consists of three parts.

Under the first part of the call, marine tidal and wave energy projects with the annual output of over 250 MW/h are being sought.

The second part of the call is seeking proposals for technology that would accelerate the development of renewable energy at sea. ADEME is seeking innovative technology components for tidal, wave and floating turbines.

The call concerns the following technology components: electrical equipment, PTO, generators, cables, anchors, floating solutions, and innovative installation and maintenance methods, among others.

The third part of the call is focused on river and estuarine tidal energy generation. The eligible projects must consist of at least five turbines with 30 kW capacity each.

The funding, provided under the 'Investment for future' programme (PIA), targets projects whose overall cost is greater or equal to €2 million.

The deadline for the project proposals is March 20, 2017, with two intermediary closures set for January 25, 2016, and September 19, 2016.

International

Siemens lands major Qatar order

Siemens has been awarded a major order by Qatar's state-owned utility Qatar General Water & Electricity Corporation (Kahramaa) to help the

utility expand its power distribution network.

Siemens is to deliver 18 turnkey substations under an order worth €470 million, its largest yet in the country. Completion of the project is scheduled for 2017.

The order encompasses the design, engineering, supply, installation, and commissioning of 14 new substations for the 400 kV, 132 kV, 66 kV, and 11 kV voltage levels, including switchgear, transformers, control and protection equipment, and the extension of four existing substations.

All substations are required to supply power for ongoing infrastructure development projects, schools, hospitals, and residential complexes. The substations are located in and around Doha, the capital of Qatar.

Siemens will execute the order as part of the ongoing Qatar Power Transmission System Expansion - Phase XII. Since the beginning of the programme in 2005, Siemens has installed more than 110 substations and approximately 1400 km of high-voltage cable. Siemens has completed all projects to date, totalling nearly €2 billion, within the defined schedule.

Saudi strengthens grid with \$150 million order

ABB has won orders worth around \$150 million from the Saudi Electricity Company (SEC) to expand five existing substations, helping to ready the country's transmission system for a 50 per cent expansion of power generation capacity to accommodate a growing economy.

SEC, Saudi Arabia's national power transmission and distribution operator, is increasing the capacity of the substations, with three located in the central region and one each in the eastern and western regions.

Saudi Arabia is set to increase power generating capacity from 60 GW to around 91 GW by 2020.

KPA Unicon to deliver boiler plant

KPA Unicon will deliver a 50 t/h steam boiler plant to the Vanderbijlpark Works of ArcelorMittal South Africa Ltd. This is a turnkey delivery including all process equipment, transportation to South Africa, all installation work, commissioning and training of operational personnel. KPA Unicon arranged the financing of the project.

The plant will be fuelled with blast-furnace and coke oven gas which are by-products from the iron making process. Natural gas can also be used as fuel. The steam produced will be directed to the customer's existing turbine which generates electricity for internal consumption.

EDS selects OpenLink

Energy Delivery Solutions (EDS) has selected OpenLink's power and gas solution to help it manage its trading operations in southeast Europe.

Rising power demand and falling prices in the Balkans are creating a more liquid energy trading environment. In July, energy ministers agreed to set up a regional power market in 2016 to meet rising demand, and increase security of supply.

OpenLink will provide EDS, a Macedonia-based energy trading company, with a fully automated front to back solution enabling contract management, transfer price modelling, automated scheduling and nomination across foreign markets, settlement data generation and scenario modelling of margins across multiple entities, enabling quicker and more accurate trading decisions.



Oil

Everything points to more oil, lower prices

- Opec production hits three-year high
- Falling oil prices will slow Saudi Arabia economy

David Gregory

In mid-August, West Texas Intermediate (WTI) crude was slipping closer to that \$40/b mark and Brent crude had fallen below \$50/b, and there was nothing on the immediate horizon that suggested crude prices would not fall further.

At the time, market watchers were acknowledging a global supply glut and contemplating a possible economic slowdown in China that would likely lead to a further fall in demand that would push prices lower. Some analysts were saying that while there might be hiccups that cause a brief rise, the outlook called for oil price to decline even more.

The US Energy Information Administration (EIA) reported in its August *Short-Term Energy Outlook* that Brent crude had fallen by \$5/b in July to average \$57 for the month, and that WTI had fallen by \$9/b during July to average \$51/b for the month.

"Continuing increases in global liquids inventories put significant downward pressure on prices," the EIA said. "Inventories rose by an estimated 2.3

million b/d through the same period last year. Inventory builds are projected to moderate in the coming months but are expected to remain high compared with previous years," it said.

WTI inventories at Cushing, Oklahoma, USA, had declined by 5 million barrels from a record high of 62.2 million barrels in April, but were still 40 million barrels more than the same time last year, the EIA said.

The EIA projected that Brent crude would average \$54/b in 2015 and \$59/b in 2016. WTI would average \$5/b lower than the Brent price, the administration said.

"The oil market faces a host of uncertainties heading into 2016, including the pace and volume at which Iranian oil re-enters the market, the strength of oil consumption growth, and the responsiveness of non-Opec production to low oil prices," the EIA said in the report.

Total US crude output fell by 100 000 b/d in July compared to June the administration reported, adding that production is expected to continue falling through mid-2016 before growth resumes in late 2016. The EIA

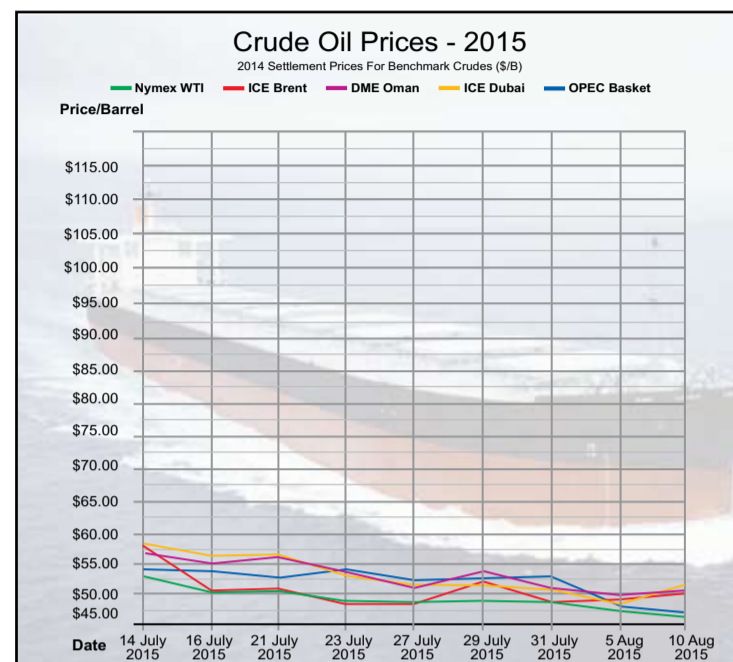
predicted US crude production would average 9.4 million b/d in 2015 and 9.0 million in 2016.

Opec production for 2015 is expected to average 30.9 million b/d, the EIA said, noting that oil output continues to decline in Libya, Angola, Algeria and Kuwait, but is offset by growing production in Iraq and Iran. Opec crude production in 2016 is expected to stay flat.

Higher crude production is expected from Iran if international sanctions are suspended. The country produced 3.6 million b/d in 2011 before the latest round of sanctions were introduced. Current output is around 2.8 million b/d.

Opec leader Saudi Arabia and other Opec countries are not expected to cut production in order to accommodate a boost in Iranian production and exports, the EIA said, and while Iraqi production is growing, it may see difficulties in sustaining those production numbers due to infrastructure constraints at its Gulf terminals.

Energy media have reported that Opec produced as much as 31.4 million b/d in July, the highest rate in



three years. And of this, Saudi Arabia produced 10.45 million b/d.

More than any other factor, falling crude oil prices are seen as the result of Saudi Arabia's policy of defending its market share, particularly against US shale oil producers, but also other non-Opec producers. Saudi Arabia has been producing oil at a rate of 10 million b/d since March and there has been no signal from the Saudis that output will fall below that.

Meanwhile, Opec in its latest *Monthly Oil Market Report* (MOMR) forecast global oil demand to average 92.7 million b/d in 2015 and 94.04 million b/d in 2016. Of this, Opec said non-Opec crude supply would average 57.46 million b/d in 2015 and 57.73 million b/d in 2016. The call on

Opec crude for those years will average 29.23 million b/d and 30.12 million b/d respectively, the report said.

The world has taken note of Saudi Arabia's falling financial reserves and the International Monetary Fund (IMF) has gone so far as to urge Riyadh to undertake sizeable multi-year fiscal adjustments that would cut energy subsidies, control public sector wages, and increase earnings from sources other than from oil. The IMF also suggested a value-added tax (VAT) and a tax on land, the *Wall Street Journal* reported.

Saudi Arabia will see economic growth slow this year and in 2016 due to falling oil prices, and government spending will have to be reduced in order to compensate, the IMF said.

Gas

TAPI gas pipeline selects Turkmengaz as project leader

The Turkmenistan-Afghanistan-Pakistan-India (TAPI) gas pipeline project has selected Turkmengaz to lead the project. But the choice of project leader does little to instill confidence that the proposed pipeline will materialise by the envisaged startup date.

Mark Goetz

A gas pipeline to transport Turkmen natural gas to Pakistan through Afghanistan has been discussed for about two decades. The original backers of the project have slipped away and somewhere in the middle of those years, the project was expanded to include India.

In early August, members of the Turkmenistan-Afghanistan-Pakistan-India (TAPI) gas pipeline project selected Turkmenistan's state-owned natural gas company Turkmengaz to lead the project. But the choice of project leader does little to instill confidence that the proposed 1800 km pipeline will materialise by the envisaged 2018 startup date.

A groundbreaking ceremony is scheduled to be held in December, but there are questions about whether the project, estimated to cost \$10 billion, will get much beyond that.

Apart from the serious security questions posed by the pipeline passing through Afghanistan, where the

government has little control beyond Kabul, there appears to be little faith in Turkmengaz as having the wherewithal to push the project through.

Critics say the reluctance of Turkmenistan to have a foreign company operating in its onshore area led to the selection of Turkmengaz after companies such as ExxonMobil, Chevron, Total or Petronas had been under consideration. Turkmenistan is reported to have refused to offer stakes in the onshore field that would feed the pipeline to any of the foreign firms. Ashgabat's policy is and has been not to allow foreign companies to participate in onshore development. There are a few exceptions.

"The countries can break ground all they like, but without a Total- or Petronas-type company behind the pipeline, any momentum is all but nullified," a commentator wrote in *The Diplomat*. Other critics wrote that with this move Turkmen President Gurbanguly Berdimukhammedov had sealed his failure to open the country's economy.

The Times of India wrote that since none of the state-owned companies involved in the project have the financial muscle nor the experience of operating a transnational pipeline, an international company is needed to build and operate the project.

The pipeline would transport 33 billion cubic metres (bcm) of Turkmen gas annually from the Galkynysh field to markets in each of the member countries for 30 years as of 2018, or by 2020. The pipeline would run from the Turkmen field to Herat and Kandahar province in Afghanistan, then to Quetta and Multan in Pakistan, and then to Fazilka in Punjab Province in India.

Galkynysh holds gas reserves estimated at 16 trillion cubic feet. The pipeline would transport 90 million cubic feet per day (mcf/d). Afghanistan would receive 14 mcf/d, while Pakistan and India would receive 38 mcf/d each.

Should TAPI fail to gather traction, India is considering an alternative plan that would see a pipeline

stretching through Iran from the Turkmen border to the Persian Gulf or Arabian Sea from where an underwater pipeline would carry gas to India.

The idea could become a possibility when and if international sanctions against Iran are lifted. India has been involved with the construction of a new port in Iran at Chabahar on the Arabia Sea coast. The port is considered to fit into India's plan to gain access to Central Asia without having to pass through Pakistan. Various ports suggest that India is thinking of an underwater pipeline that from Chabahar would access natural gas supplies in Iran and Central Asia.

Meanwhile, if Iran should find itself able to operate without the threat of international sanctions, the Iran-Pakistan-India (IPI) gas pipeline could gain momentum. Sanctions had stalled the project, which would transport Iranian gas to Multan and then New Delhi.

For its part, Russia has recently initiated a draft agreement to become

involved in Pakistan's North-South gas pipeline, which would run from Karachi on the coast to Lahore, some 1200 km to the north. Construction on this project is due to begin in 2016.

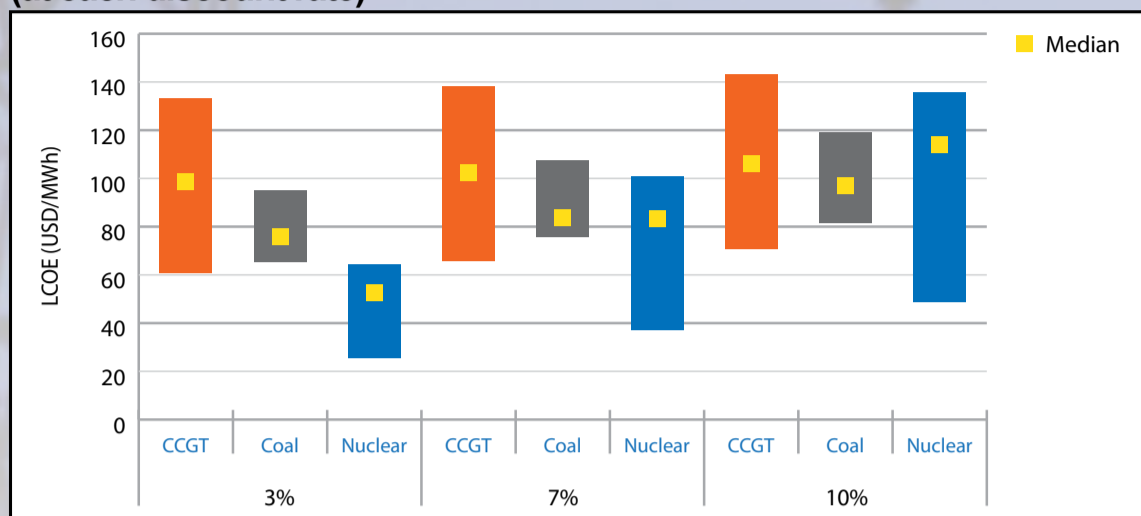
Russia's role in Pakistan's North-South pipeline is seen as challenging TAPI. Russia was once a major importer of Turkmen gas, which was bought cheap and sold at a higher price in Europe.

Differences between the two countries began to emerge and Turkmen gas sales to Russia fell from about 40 bcm/year in 2008 to the current rate of 4 bcm/year. Sales averaged about 10 bcm/year from 2009 to 2014.

Several Russia projects designed to import large amounts of Turkmen gas and improve Turkmenistan's pipeline system fell through, primarily because of disagreements over the price.

Recently a price dispute in which Turkmengaz accused Russia's Gazprom of not paying for gas imports has wound up in the international arbitration court in Stockholm.

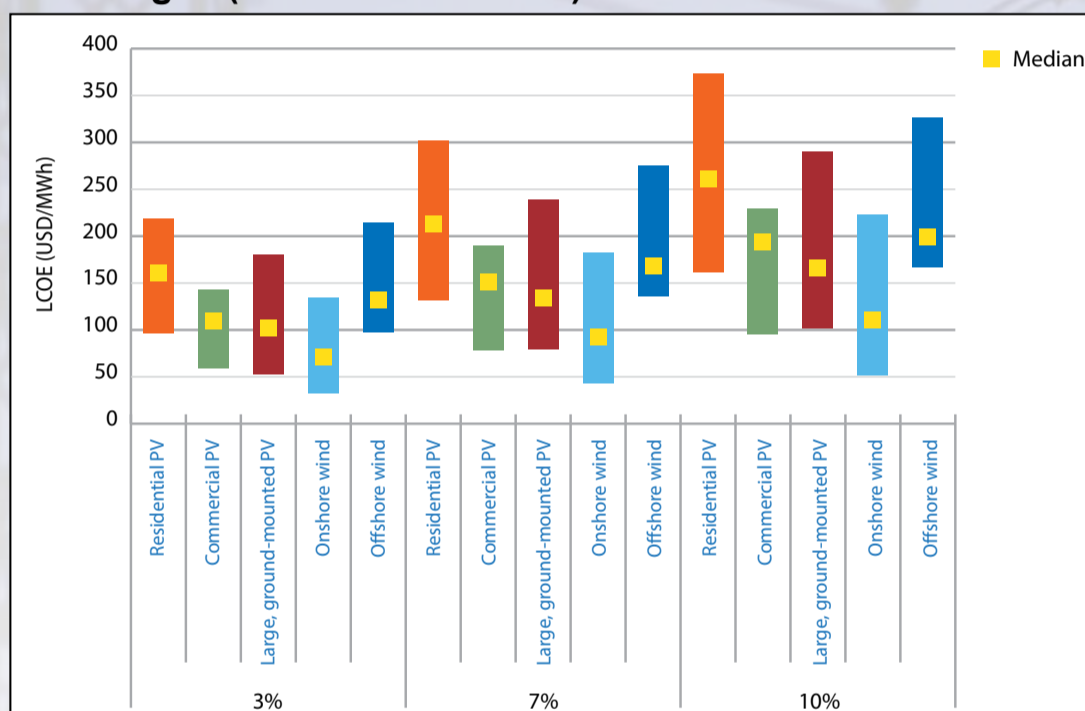
Levelised Cost of Electricity (LCOE) ranges for baseload technologies (at each discount rate)



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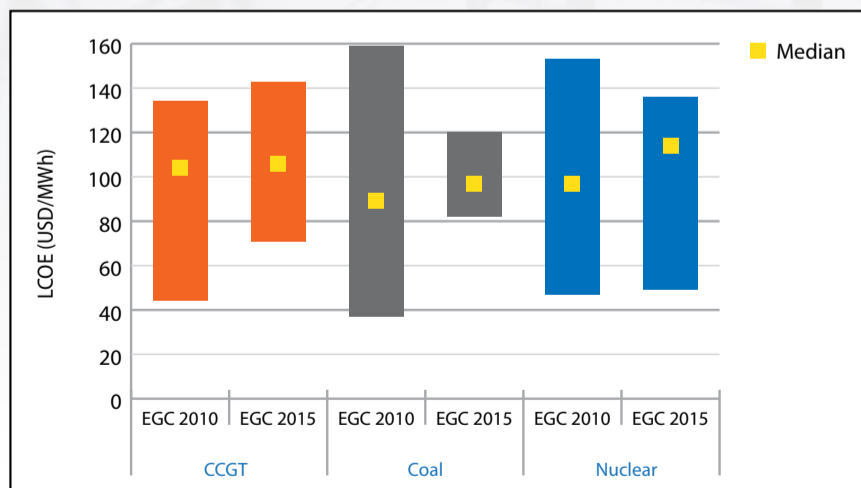
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Levelised Cost of Electricity (LCOE) ranges for solar PV and wind technologies (at each discount rate)



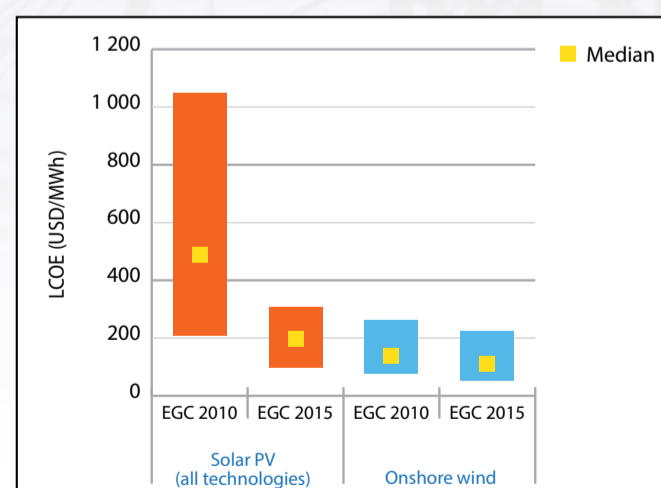
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Electricity Generating Costs (EGC) 2010 and EGC 2015 LCOE ranges for baseload technologies (at 10% discount rate)



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Electricity Generating Costs (EGC) 2010 and EGC 2015 LCOE ranges for solar and wind technologies (at 10% discount rate)



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Casting a shadow over solar?



Ferris: if renewables will always need a form of support, it can be argued that the approach taken by the renewables industry has invited the action taken by government to cut their subsidies

Will recent UK government cuts to green levies create another boom and bust for the solar industry? **Jon Ferris**, Head of Energy Markets at Utilitywise offers some insights.

As expected, the UK government announced a reduction in the support for renewable generation in order to try to keep the Levy Control Framework (LCF) below the cap of £7.6 billion (\$11.8 billion) in 2020/21. The LCF is a tool aimed at controlling costs to consumers arising from government energy policies.

The Renewables Obligation (RO) will cease for small-scale solar farms, below 5 MW capacity from April 2016, feed-in-tariff (FiT) rates will be reviewed, and there will be changes that will allow support levels for biomass and small-scale solar to be amended over time.

However, while the LCF provides support for low carbon generation, less attention has been paid to other green taxes that go straight to the Treasury without benefitting either consumers or the green economy.

Hinting at the announcement when appearing before the Energy and Climate Change Select Committee, Amber Rudd, UK Secretary of State for Energy and Climate Change, challenged the renewables industry to beat its target of becoming subsidy-free by 2020. However, there is growing recognition that renewables will require support in addition to market prices, and the recent announcement increases doubts that renewables will become subsidy-free in the future.

A growing proportion of the cost of electricity described as 'green taxes' does not actually support the generation of renewable electricity, but instead has become a tax on consumption. Figures published by the Office for Budgetary Responsibility (OBR) show that in 2014/15 £2.5 billion raised from the Carbon Reduction Commitment (CRC), Climate Change Levy (CCL), Carbon Price Support (CPS) and EU Emissions Trading Scheme (ETS) went to the Treasury.

Changes outlined in the summer Budget will only increase this figure, as the CCL scheme has now been changed so that renewable generation is no longer exempt from the

Levy. This removes the support it previously gave to renewable generators and will increase the Treasury take by £450 million in 2015/16. In total, these costs are expected to increase by 36 per cent to £3.4 billion.

While this cost is largely no longer accruing to renewable generators, who had come to expect it since the introduction of the scheme, it is however affecting business and public sector consumers, who might previously be exempt from paying the CCL by contracting with a supplier for renewable electricity. Indeed, the HMRC informal consultation on the transition period ignores the plight of renewable generators, and focuses exclusively on the impact it will have on suppliers in meeting contractual obligations to supply renewable electricity.

The CPS on the other hand was frozen from 2015 at £18.08/tCO₂, which is just below the level required to support profitability of gas fired generation ahead of coal, but remains a significant cost to consumers.

While 50 per cent of the revenue raised by auctioning EU ETS certificates was committed to tackling climate change in the EU and developing countries, this commitment is not legally binding. The UK government's position against determining spending based on the way revenue is raised, means that EU ETS revenue from auctions is not earmarked to fund specific projects.

Support for renewable generation from the Renewables Obligation (RO), Contracts for Difference (CFD) and FIT in 2014/15 was £4.1 billion. This meant that 38 per cent of green taxes paid by consumers went straight to the Treasury, a figure that will increase to 40 per cent in 2015/16.

In addition to budget changes for CCL, the renewables sector has already endured the impact of automatic degeneration of FIT rates, where rates decrease once capacity targets are reached, the early closure of the RO to large-scale solar and onshore wind, and auctions for CFDs, where renewable power projects compete

for support from limited funds.

Indeed, the introduction of the FIT with no planned degeneration is perplexing, as the German model on which it is based not only had automatic reductions planned from the start, but had also been reduced further due to the falling cost of photovoltaic modules before the UK scheme went live and then again in 2011, by which time the rate had fallen by half from 2004.

The sudden reduction in rates has also had the counter-productive effect of increasing LCF costs earlier than had been anticipated as developers rush to install capacity before the deadline. This was seen twice – firstly before the FIT was reduced, and then when the RO was closed to large-scale solar.

The sector has suffered from a lack of clarity over the purpose of the subsidies. Are they to support innovation, protect new industries against established competitors, encourage decarbonisation of the electricity generation sector, or to correct for market failure? The removal of a scheme can therefore be justified because it has achieved one of these aims, but withdrawing support also means that the other objectives will not be achieved.

Wind and solar technologies have matured rapidly over the last decade, with costs falling rapidly, and supply chains have been developed. The CPS premium over EU ETS sets a higher carbon price for fossil fuels. On this basis, a reduction in the initial subsidies would be justified.

Without additional subsidy the current wholesale market structure will not support the cost of inflexible low carbon generation, as evidenced by the increasing prevalence of negative prices at periods of high renewable output. While consumers benefit from the resulting lower wholesale prices, it pushes the cost at which renewables become truly subsidy-free further out of reach.

Markets are frequently constructed to serve a purpose. The current bilateral wholesale trading arrangements were introduced in 2001 to replace

the previous pool structure, before the disruptive growth in renewable generation. Ongoing support for low carbon generation could be justified to compensate for a market design where renewable generation does not benefit from its contribution to reducing wholesale prices, and thus reducing consumer costs. Higher carbon, but more flexible coal and gas benefit from the structure.

In recognition of this, there have been increasing murmurings that the CFD is not a subsidy if the strike price is less than the levelised cost of electricity (LCOE) of the marginal generation plant, which in the UK is predominantly combined cycle gas generation. This idea has some merit, as the cost of wind and solar could be lower than gas generation, but will be less profitable as gas can optimise its output to match prices.

This means that renewables will still require support outside the wholesale market, which will be viewed as a subsidy by the public. However, if renewables will always need a form of support, it can be argued that the approach taken by the renewables industry has invited the action taken by government to cut their subsidies.

Similar actions led to a rush of installations before the change to the eligibility of large-scale solar to the RO, and also directly contributed to the increased pipeline of small-scale solar projects. The latest change has the potential to cause another boom and bust for the solar industry, despite efforts to prevent this from happening once more. The deadline for developers to demonstrate a financial commitment put the Local Planning Authorities' systems under strain as applications for solar systems spike.

While it remains to be seen how much of this will be built, it is a far cry from the then government's aim in 2011 to build a competitive low-carbon economy and avoid the rapid peaks and troughs seen in other countries. In the meantime, taxes on business electricity consumption that do not support low carbon generation continue their relentless rise.

Turning the tide

New analysis from Frost & Sullivan finds that the United Kingdom is the front-runner in the development of newer tidal energy solutions while Canada, China and South Korea are showing steady progress. However, a joint effort from regulatory, technology, funding and infrastructure stakeholders globally is needed to turn the tide in favour of this renewable source.

Lekshmy Ravi

History of tidal energy

There are various ways of harnessing energy from the ocean, e.g. wave energy, tidal energy, marine current energy, ocean thermal energy and osmotic power. Of these, tidal energy achieved commercialisation early on.

But although there are a few commercial scale plants operational across the globe, the total amount of power currently produced is minuscule compared to the total estimated potential (approximately 1 TW of energy can be extracted from shallow waters).

The main advantage of tidal energy is that tides are predictable well in advance, even up to a number of years in advance. Also due to the higher density of water, a small energy conversion device can also generate substantial amounts of power.

Currently, operational tidal power plants mostly operate as tidal barrage or tidal stream plants.

Most of the larger operating tidal energy plants such as La Rance Tidal Barrage (240 MW), France; Sihwa Tidal Power Plant (254 MW), South Korea; Annapolis Royal Generating Station (20 MW), Canada; and Ji-angxia Tidal Power Station, China (3.2 MW), are based on tidal barrage technology.

SeaGen (1.2 MW) is the first large scale tidal stream power plant in the world, located at Northern Ireland, UK. There are no commercial plants currently operational on the concepts of tidal lagoons and dynamic tidal power – the world's first tidal lagoon project at Swansea is expected to be operational in another four years.

Although tidal energy has a few drawbacks such as low capacity factor, environmental impact, high capital costs and variable site-specific requirements and costs, it has proven itself as a robust source of renewable energy. The La Rance

tidal power plant has been operating since 1966, while the Annapolis Royal Generating Station was first commissioned in 1984.

Most notable development of the technology has been observed in the United Kingdom, France, China, South Korea, USA and Japan. Almost half of the companies developing tidal energy devices are located in the EU where there is a supportive funding system and R&D infrastructure (such as test sites and facilities) for tidal energy developers.

A trend of collaboration, joint ventures and partnerships is quite discernible in the industry. This could be attributed to the necessity for technology transfer and sharing.

Looking at the global picture, the UK has great potential for tidal energy generation with some of the world's best tidal energy resources, though extraction of power from the tides has so far been limited. The nation's tides alone have the potential to generate almost one-fifth of its power requirements.

The country will be home to the world's first tidal lagoon project, which is coming up at Swansea Bay. The project, which will have a capacity of 320 MW, is expected to be complete in four years. Another project coming up in Scotland, is the 398 MW Meygen plant which will consist of an array of underwater turbines and is expected to start delivering power by 2016.

Canada and the USA are also doing important work. Canada is home to Bay of Fundy, Nova Scotia, which has the highest tides in the world. The Fundy Ocean Research Center for Energy (FORCE) is located at the Bay of Fundy, which specialises in tidal stream energy research. The USA, meanwhile, is encouraging the development of marine energy through funding mainly provided by the US Department of Energy.



Alstom's 1 MW tidal stream turbine installed and connected by Alstom at the EMEC (European Marine Energy Centre) off the Orkney Islands achieved the milestone of feeding 1 GWh into the grid on December 6, 2014

Asia is also an important region for tidal energy development. China with a long coastline has substantial potential in tidal energy generation and has been identified as ideal for dynamic tidal power (DTP) generation.

DTP is a new and as yet untested method of tidal power generation. It involves a long T-dam that acts as interference for oscillating tidal waves, which run along the coasts of continental shelves containing powerful water currents. China is conducting detailed feasibility studies along with the POWER group (Dutch consortium) on the adoption of DTP on the coast of China. South Korea also has good potential for DTP.

South Korea is home to the largest tidal power plant in the world, the Sihwa Lake Tidal Power Station, which has a capacity of 254 MW. An upcoming project named the Incheon Tidal Power Station is expected to

start operation in 2017. With a capacity of 1320 MW it would be the world's largest tidal power plant. POWER group is also involved in determination of suitable sites for DTP in China, South Korea and the UK.

Elsewhere in Asia, Japan is conducting research. Japan's New Energy and Industrial Technology Development Organization (NEDO) has selected IHI Corp. and Toshiba Corp. to be funded for research and development of an ocean current tidal energy turbine system.

Despite these developments, it is still early days for the industry. At the moment the major tidal energy plants across the globe operate on the tidal barrage concept. But the disadvantage of adverse environmental impact and huge capital investment is expected to result in the adoption of other technologies being deployed at a smaller scale or in the testing stage soon.

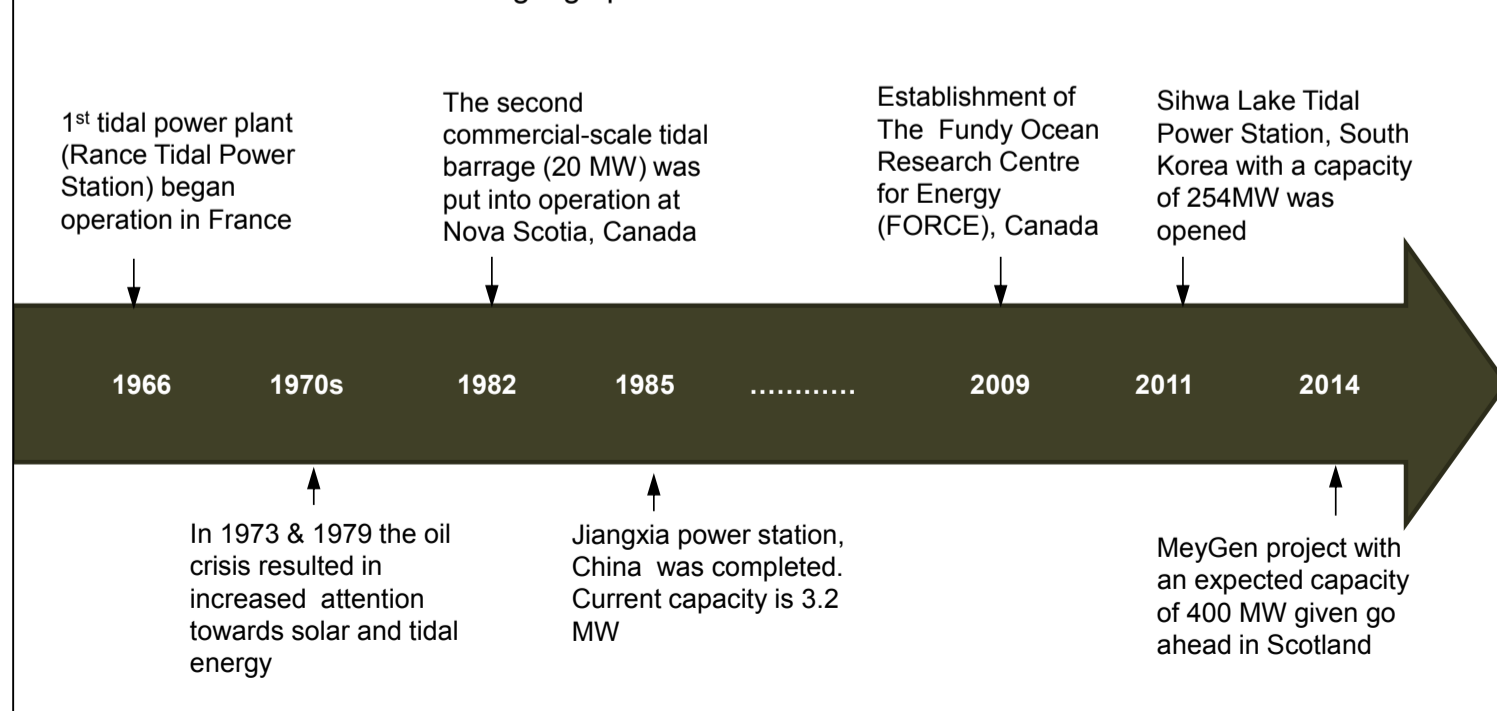
In the near future, tidal stream technologies might see immediate adoption as smaller demonstration plants are proven to be successful. Dynamic tidal power plants could be adopted if its technical performance in real field conditions is proven; though in the immediate future its large-scale adoption would not be seen.

In addition, several factors such as capital investment, environmental impact and performance need to be assessed before there is significant deployment of the technology. Hybrid energy systems consisting of a combination of tidal and offshore wind energy (currently only in the research stage) seems a more likely technology solution, although not in the immediate future.

The future of tidal energy has good potential provided that there is ample assistance for developers in the form of supportive regulatory frameworks, R&D infrastructure and state funding. The sector could create a bigger impact through a coordinated, multi-disciplinary strategy by stakeholders that could create ripples in the renewable energy sector.

Lekshmy Ravi is Research Analyst, Technical Insights at Frost & Sullivan and co-author of the report: 'Tidal Energy: Current Status and Future Outlook'. For further information email: chiara.carella@frost.com

The global tidal energy potential is estimated to be about 3 terawatt (TW) in which about 1 TW can be harvested from shallow waters. In certain regions the potential is high. For example, in Europe, France and the United Kingdom have tidal ranges of over 10 meters. In Canada, the Bay of Fundy in Nova Scotia has been identified as having high potential.



Building a solar community

US company Tendril is leveraging the capability of its Energy Services Management Platform to allow utilities to compete in the distributed energy and meet consumer demand for personalised energy services. **Junior Isles finds out more.**

Despite the ongoing boom in the solar power market, how to capitalise on rooftop photovoltaics (PV) – one of the most significant growth areas in the sector – has proven to be a dilemma for utilities.

According to Solar Europe's latest 'Global Market Outlook For Solar Power/2015-2019', last year was another record year for the industry. Some 40 GW of solar PV was connected worldwide, beating the 37 GW connected in 2013. The Outlook shows that the amount of solar PV installed in 2014 was fairly evenly split between rooftop PV and utility scale PV, with around 20 GW each.

That roughly 50 per cent rooftop PV portion of the market is something utilities would like to take a bigger share of. In the US, which was one of the top three solar PV markets last year, community solar is seen as the approach that could allow utilities to participate in the rooftop solar PV space.

Basically, a community solar installation accepts capital from, and provides output credit and tax benefits to, individuals and other investors. In some systems participants buy individual solar panels, which are installed in the farm after they are purchased. In others, participants purchase kW of capacity or kWh of production. The farm's power output is credited to investors in proportion to their investment, with adjustments to reflect ongoing changes in capacity, technology, costs and electricity rates.

Community solar essentially helps solve a quandary faced by many households. According to a survey by the US National Renewable Energy Laboratory (NREL) and the US Department of Energy (DOE), 50 per cent of homeowners cannot support these systems because they live in apartments, rent their homes, have unsuitable roofs or do not plan to stay in the residence long enough to see a payoff from traditional rooftop

solar. This means that for every homeowner that installs rooftop solar, there are many more that are not able to do so.

Yet despite the potential, existing efforts by utilities to offer community solar programmes have thus far lacked the intimacy and personalised ownership that has been the backbone of the success behind rooftop PV.

This is something US company Tendril, a leading provider of Energy Services Management (ESM) solutions, is looking to change. Chris Black, its Chief Operating Officer and Chief Technology Officer commented: "It may be a bit of a regulated utility phenomenon... but it has been difficult for them to get into solar. This is a problem because 20 per cent of a regulated utility's consumer base makes up roughly 80 per cent of the revenues. And this base happens to be the large, high consumption homes that can afford to install rooftop solar.

"This is why solar has suddenly gone from being this cute thing that utility executives didn't find threatening at all, to something that fundamentally changes the macro-economic environment. Community solar projects can solve a lot of the utilities' problems – things that they are actually regulated to solve."

In a move to help utilities enter the community solar space, Tendril is bringing what it calls a "turnkey community solar offering" to utilities. The company has partnered with SunPower – the world's second largest solar manufacturer, and also an investor in Tendril.

Black said: "Through our relationship with SunPower, we can bring everything from putting the panels in the ground to identifying the right people to participate in the programme, to using our micro-targeting capabilities to reach out to and recruit those people, enrolling them and the ongoing engagement experience for those users."

The Tendril Community Solar solution is comprised of three distinct offerings that can be used together or separately, depending on the needs of the utility. These are: customer acquisition; lead qualification and pre-sales engagement; and ongoing consumer engagement.

An ongoing user experience is something that Black believes has been missing in the past, which has led to a high drop-off in previous community investor-type programmes. It is something Tendril is looking to change.

Tendril argues that to-date, the customer base been underserved by rooftop solar providers.

With its new solution – encompassing marketing, solar sizing and ongoing customer engagement – Tendril says utilities can now accelerate the development of community solar projects while providing a very personal energy experience.

Black said: "Our solutions can already show users how they consume [energy] in their household. We can give mobile experiences, web portal experiences, paper-based solutions that compare you to similar households and give you recommendations to make you more energy efficient."

While this is interesting, what is particularly notable, says Black, is that in a community solar project, participants can now visualise their generation as well. For example, a participant can visualise six panels in a solar farm 50 km away just as if they were installed on their roof.

"This allows you to see real-time generation overlaid against consumption to give you the tools you need to help align your curves so you are consuming when you are generating and hopefully not consuming when you're not generating. This really changes the experience for users who can see what they are getting for their solar tariff," noted Black.

An important part of the system is what Tendril calls a "physics-based"

home simulation model. The company collects data from third party sources and runs a simulation model to predict how a home consumes energy. Tendril says it has a lot of information on every home in the US and is gathering information in several countries, including Australia and some in Europe.

"When we drive someone to the enrolment site, which uses our physics engine, the first thing we do is use that address to pull all the publicly available data about the home. This allows us to run a simulation on the home about how it consumes energy in real-time – down to 50 ms," said Black.

This allows Tendril to provide a very targeted marketing message for potential customers, thus achieving a higher uptake at lower cost.

This is key in reducing the burden on utilities of customer acquisition, which Black says typically represents 50 per cent of a system. "For traditional rooftop solar guys, if an installation costs \$30 000, then roughly \$15 000 is spent on acquiring the customer. It's a long and complex cycle, which is even harder for utilities because they don't have a lot of marketing DNA."

He added: "Using our micro-targeting approach, we have seen a 3-5 times conversion rate for utility customers and something like a 50 per cent lower cost to do it."

The system also helps customers understand their unique financial impact and available options in terms of panel sizing, pricing, and savings.

Black explained: "Once we know how much your home consumes, the participant can choose how much of their consumption they want to offset [with solar panels] and calculate the number of panels needed to cover that consumption. Once we know that, we can calculate the economics around it. The economics are different from utility to utility, depending on how the programme is being funded."

The system is as yet untested. According to Tendril a lot of utilities are in the planning or approval process and working out how these community solar projects will be funded. The first implementations are expected to be in the US where discussions are ongoing with several utilities and the first systems could be implemented next year. Europe and the rest of the world would then follow.

The beauty of the system, says Black, is that it is a completely web-based software solution. There is no need for users to install hardware or any need for utilities to have a smart meter on the premises. All that is needed is for Tendril to integrate with the solar farm. The company is confident of the prospects for deploying the system, noting that utilities can still benefit even if it does not need the full turnkey solution including the panels. It also pointed out that it also has benefits outside of the community solar space.

Black concluded: "Community solar is just one of the things we do. Although we're not having any community solar conversations yet in Europe, we are leveraging a lot of our other engagement solutions to solve other problems for competitive retailers in Europe. For example, we are making them better at acquiring customers and keeping those customers happy to reduce [customer] churn rate."

Utilities can now accelerate the development of community solar projects while providing a very personal energy experience

PV ROOFTOP INSTALLMENTS ARE BOOMING

Q3 2014 represented the second largest quarter ever for solar installations in the U.S., with an increase of 41 percent over Q3 2013.

41%+

40 MW

2014


10 MW

2013


HOWEVER,

50% ARE EXCLUDED


from rooftop PV for the following reasons:




HOME IS RENTED



TOO MUCH SHADE




UNSUITABLE ROOF



UNABLE TO COMMIT

AND UNAWARE THAT COMMUNITY SOLAR IS AN OPTION



what is community solar?

Current community solar installations suffer from limited awareness, complexity and a lack of intimacy

OPPORTUNITY FOR UTILITIES

With their unique understanding of consumers and low cost of capital, utilities can now market and sell community solar to all customers.

- Retain customer relationships
- Create grid-friendly solar garden
- Offer customers more choice

Accelerate the development of community solar projects through enhanced marketing and personalized engagement with

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www.tendrilinc.com/solving-your-needs/community-solar

- 1

ACQUIRE CUSTOMERS

Lower the high cost of customer acquisition
- 2

QUALIFY LEADS

Streamline the sales process and ensure a steady stream of leads
- 3

ONGOING ENGAGEMENT

Enable customers to manage panels as if they were on their rooftops



Junior Isles

Winners, losers and lawyers

In life there are winners and losers. And then there are lawyers.

It will be some time before all the experts and pundits wade through the 1560 pages of the 'US Clean Power Plan (CPP) Final Rule' released last month, but already it is clear that there are winners and losers, as well as impending litigation.

On August 3, 2015 US President Barack Obama and the Environmental Protection Agency (EPA) unveiled what is hailed as an "historic and important step in reducing carbon pollution from power plants that takes real action on climate change". These are the first-ever national standards that address carbon pollution from power plants, the largest source of carbon dioxide emissions.

The plan is aimed at ensuring carbon pollution from the power sector will be 32 per cent below 2005 levels by 2030. The 32 per cent level is higher than the 30 per cent figure the EPA originally proposed but states have until 2022, instead of 2020, to start

making reductions. States must submit plans by September 6, 2018 at the latest; those that do not submit plans will have to follow a plan devised by the EPA.

While the final rule provides 15 years for full implementation of all emission reduction measures, there are incremental steps for planning and demonstration that will ensure progress is being made in achieving CO₂ emission reductions.

In addition to the release of the CPP, the EPA proposed a Federal Plan and model rule to assist states in implementing the CPP.

States can also reach their prescribed level indirectly by combining emission reductions with other measures such as energy efficiency and demand side management and the promotion of renewable generation. The final rule also gives states the option to work with other states on multi-state approaches, including emissions trading.

The EPA is establishing interim and

final CO₂ emission performance rates for two sub-categories of fossil fuel-fired electric generating units: fossil fuel-fired electric steam generating units (generally, coal- and oil-fired power plants) and natural gas-fired combined cycle generating units.

Clearly, generators that are most dependent on coal to produce power will be hit hardest by the plan, while those with a large renewables portfolio will benefit most.

The World Coal Association said the plan "will significantly increase the cost of electricity to American consumers." The Solar Energy Industries Association, however, said the rules were "historic" and "critically needed". Meanwhile, trade body, America's Natural Gas Alliance, said it was "disappointed and discouraged" by the rules.

Analysts Robert W. Baird & Co. issued a report assessing winners and losers from the EPA proposal. It says renewable power sources, natural gas generation and energy efficiency will be the winners – if the EPA rule survives legal challenges.

The firm also believes nuclear power will be a loser under the EPA rule. David Parker, Senior Utility Analyst, said nuclear power plants generate no greenhouse gas emissions, but noted the EPA made changes to the final rule that effectively pushes them "on the sidelines as a tool to meet" the carbon targets. The CPP assumes nuclear power will retain its current share of electricity generation through 2030, but does not include steps to prevent the retirement of existing reactors.

As expected, the CPP received a varied reaction from the industry. With many generators having mixed generating portfolios, many have reserved comment on the CPP, perhaps concluding that some version of the plan would be adopted regardless of objections and saw no reason in angering the EPA.

The Edison Electric Institute (EEI), which represents all US-based investor-owned electric companies, was more measured in its comments on the plan, as its members include both supporters and opponents.

In a statement following its release, EEI President Tom Kuhn said his organisation raised a number of issues with the EPA while it was formulating the plan. He said: "The agency seems to have responded to some of our key concerns."

Of the big power generators with large coal fleets, only Atlanta-based Southern Co. really publicly let off steam on the plan, complaining that President Obama is exceeding his authority in many of his initiatives.

"As Southern Co. continues its initial review of the Clean Power Plan, we believe that the EPA extended beyond its authority in creating the most far-reaching environmental rules in the agency's history," the company said in a statement it put out after the plan was released.

The company's Chairman and CEO Tom Fanning restated that view on MSNBC's news programme *Squawk Box*. He said: "When you think about policy, you generally don't think about regulation, you think about Congress." He was making the point that federal lawmakers should have the chance to review the plan and either approve it or not.

It is no wonder that the coal industry

has in general come out fighting. Of the 326 GW of current coal power capacity in the US, a potential 60 GW could be lost by 2020 due to the CPP according to research and consulting firm GlobalData.

Pavan Vyakaranam, GlobalData's Associate Project Manager covering power, says that of the 326 GW of current coal power capacity in the country, around 20 GW is expected to be retired in the next five years and a further 30-40 GW will find it difficult to meet the emission standards set by the EPA.

Unsurprisingly, the fight against the plan is being led by coal-producing states such as Wisconsin and other Midwest and Rocky Mountain region states, which stand to lose the most if the coal-mining business disappears.

Indeed, 15 states led by coal-producing West Virginia, filed a petition for an emergency stay with the US Court of Appeals against the plan. West Virginia Attorney General, Patrick Morrisey, led the opposition to the plan.

Meanwhile, Attorney Generals from 15 other states, New York City and the District of Columbia responded to the filing with their own statement supporting the plan and saying they would fight efforts to block its implementation.

If the plaintiffs are successful in their request for emergency relief, the government is likely to appeal. According to experts, the U.S. Supreme Court typically looks at full cases and not at appeals involving emergency relief, and therefore might not agree to hear the appeal. This would leave the case to proceed in the D.C. Court of Appeals with the plan's implementation on hold, according to Jim Wrathall, a counsel in the Washington, D.C., office of Sullivan & Worcester.

The plaintiffs' arguments are largely based on a discrepancy in the drafting of the 1990 Clean Air Act amendments that resulted in the House and Senate versions of them not being reconciled, meaning two versions of the amendments exist.

They argue that, under one of those versions, the EPA cannot regulate carbon dioxide from power plants under Section 111 (d) of the Clean Air Act – which the EPA has cited as the legal authority for the Clean Power Plan – because the EPA already regulates power plants for certain hazardous air pollutants under Section 112 of the act.

Meanwhile, the EPA counters that the amendments do not conflict and that it is acting within its authority.

It could take years for the legal challenges to unwind, a situation that will no doubt have the lawyers rubbing their hands.

In its report, Robert W. Baird & Co. listed lawyers among the winners in light of all the money that will be spent litigating the matter.

Parker commented: "We find it likely that infrastructure investment remains stalled in the next few years as many states forgo any action plan development until court appeals are decided."

If infrastructure stalls, consumers will lose and the fight against climate change would have taken a backward step and while there will be some winners, there will be many losers. But no matter who wins or loses, one thing is certain: the lawyers always win.

Well, I don't know about the power generators, but it looks like a thick wad of dollar bills to me

