THE ENERGY INDUSTRY TIMES

January 2015 • Volume 7 • No 11 • Published monthly • ISSN 1757-7365 www.teitimes.com

The bioenergy crystal ball

This could be an interesting year for bioenergy, predicts the EBRI.
Page 13

Navigating risky terrain

Can Hinkley Point C help turn-around risk ratings for nuclear?
Page 14

Final Word

Lima leaves a sour taste for some, says Junior Isles
Page 16

News In Brief

E.On responds to "altered" energy market

German energy giant E.On says it will spin-off its conventional generation, energy trading and upstream activities into a new company, while retaining the existing company as a dedicated renewable energy business.
Page 2

Coordinated approach needed for sustainable energy future

The United States is in a strong position to deliver a reliable, affordable and environmentally sustainable energy system, according to a recent report by the International Energy Agency.
Page 4

Nuclear, solar central to cutting India's GHG emissions

Nuclear and solar are taking centre stage as India announced plans for new generating capacity that will help keep a lid on carbon emissions.
Page 6

South Africa moves to tackle power crisis

South Africa has set up a 'war room' to oversee the implementation of a five-point plan to tackle its deepening power crisis.
Page 8

Chinese companies use M&A to bypass trade disputes

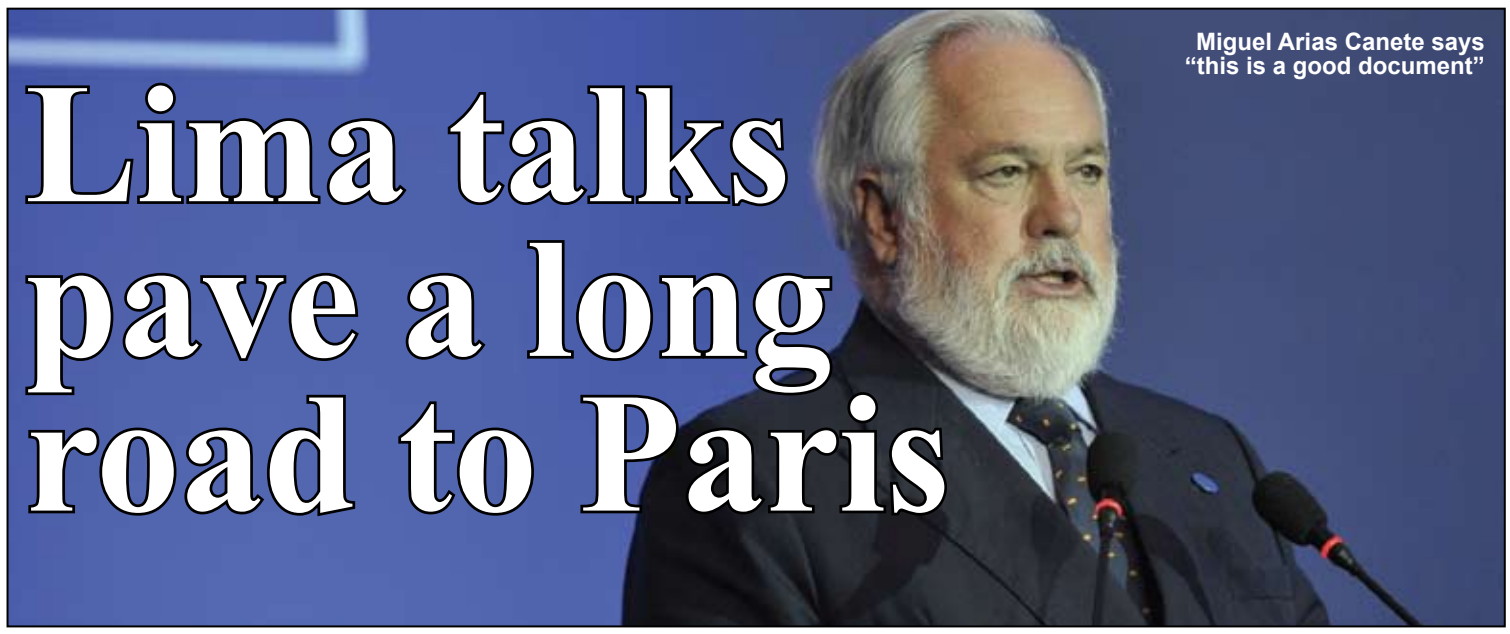
Several Chinese companies are undertaking mergers and acquisitions (M&A) in response to international trade disputes with the US and Europe.
Page 9

Fuel Watch: EU seeks alternatives to South Stream

The demise of South Stream has given new impetus to gas import and transportation projects under consideration or in the early stages of development.
Page 11

Technology: Geothermal meets biomass at Cornia 2

A pioneering project is now under way in Italy that will combine biomass and geothermal technologies.
Page 15



Miguel Arias Canete says "this is a good document"

Lima talks pave a long road to Paris

Climate change talks at the COP 20 meeting in Lima leave climate change negotiators with a big mountain to climb in the run-up to Paris. **Junior Isles**

The United Nations Conference of Parties (COP 20) concluded in Lima last month keeps hope alive for a global climate agreement but leaves negotiators with an uphill struggle to reach an agreement by the end of the year.

After a two-week meeting in the Peruvian capital that ran more than a day into over-time, climate change negotiators agreed on a communiqué, officially called the Lima Call for Climate Action. The agreement sets out the building blocks of a new global deal to combat climate change, scheduled to be signed in Paris in December 2015.

"This is a good document to pave the way to Paris," EU Climate Action and Energy Commissioner Miguel Arias Canete said at the end of the talks.

Under the Lima plan, national pledges:

- Should be submitted by March 31, 2015 by "those parties ready to do so", and as soon as possible thereafter by the rest;
- Will be self-determined;
- Must improve on a nation's current carbon-cutting undertakings;
- May include information on the base year used as a reference for emissions cuts, time frame for implementation, and the methodology for calculating the numbers;
- Will be published on the website of the UN Framework Convention on Climate Change (UNFCCC);
- Will be assessed by the UNFCCC secretariat on their aggregate effect on the UN goal to curb global warming to two degrees Celsius over pre-industrial levels.

National pledges will be added up in a report by November 1, 2015, to assess their aggregate effect in slowing rising temperatures. However, after opposition led by China, there will not be a full-blown review to compare each nation's level of ambition.

There had been danger of the talks collapsing as rich nations and developing countries remained at loggerheads over who should bear the burden of cutting carbon emissions. The final text appeased developing countries, led by China and India, who were concerned that previous drafts imposed too heavy a burden on emerging economies compared to the rich.

Continued on Page 2

Climate talks put spotlight on fossil fuel investment

Investment in fossil fuels has come under intense scrutiny as governments work towards a new climate change agreement.

During the COP 20 meeting in Lima, Peru, last month, environmental groups demanded stronger rules on climate finance to poor countries after an *Associated Press* (AP) report drew attention to Japan's funding of coal-fired power plants with money earmarked for fighting global warming.

On the sidelines of the UN climate talks, green groups urged the Green Climate Fund to exclude money for fossil fuels. Rich countries have already pledged about $10 billion to the fund, which is meant to become a key source of finance to help developing countries counter climate change.

AP reported that Japan included $1 billion in loans for new coal plants in Indonesia in the climate finance it reported to the UN in 2010-2012. Japan says those plants are cleaner than older coal plants, though they pollute more than other energy sources.

Japan, a top contributor of climate finance, denies any wrongdoing and has done nothing illegal – there are no rules against counting such projects as climate finance in the UN system.

"There are countries... that cannot afford to have other methods than coal," said Japanese Foreign Ministry spokeswoman Takako Ito. "For these countries, we'd like to provide the best method of reducing carbon dioxide."

However, UN climate chief Christiana Figueres, who was unaware that the Japanese-funded coal plants in Indonesia were labelled as climate finance, said "there is no argument" for supporting such projects with climate money.

"Unabated coal has no room in the future energy system," she told *AP*. "Over time, what we should be seeing is a very, very clear trend of investment into clean renewable energy."

The coal lobby hit back saying that "picking technology 'winners' will not help" in meeting emissions targets.

Benjamin Sporton, the WCA's Acting Chief Executive, stated: "All low emission technologies will be needed. The Intergovernmental Panel on Climate Change (IPCC) has highlighted this: IPCC research shows that climate action will be 140 per cent more expensive without carbon capture and storage (CCS) and that meeting the 2°C target could actually be impossible without it.

"UN climate financing and technology mechanisms, including the Green Climate Fund, should be technology neutral and support high efficiency, low emission coal – as a first step – and CCS, otherwise we are compromising our ability to meet global emissions targets. CCS will be essential to coal, as well as gas, if we are to achieve global climate objectives."

Politicians are also now beginning to question the risks of investing in fossil fuel assets. Britain's Secretary of State for Energy and Climate Change, Ed Davey recently called for tougher rules to be applied to companies holding "risky" fossil fuel assets that could plunge in value because of global action to tackle climate change.

Analysts estimate that a shift away from fossil fuels could lead to as much as $28 trillion in lost revenues for the global fossil fuel industry over the next two decades.

The idea that fossil fuels present a risk to investors first emerged from research by a London think-tank called Carbon Tracker nearly three years ago.

Some investors are now calling for asset managers, insurers, banks and other financial groups to be more open about the size of their fossil fuel investments

"I think there is a case for making it mandatory," said Davey. "People need to know the risks."

Davey's comments follow the Bank of England's decision to examine the risks fossil fuel companies pose to financial stability.

Continued from Page 1

India's environment minister, Prakash Javedekar, said the text preserved the notion enshrined in a 1992 climate convention that the rich should take the lead in cutting greenhouse gas emissions.

"We've got what we wanted," said Javedeka.

The text also satisfied rich nations led by the United States who say it is time for fast-growing emerging economies to slow the rapid growth of their emissions. The idea of a UN deal with obligations for all nations marks a shift from the 1997 Kyoto Protocol, which obliges only the rich to cut emissions.

Christiana Figueres, the UN's climate chief, said Lima found new ways to define the obligations of rich and poor. "That is a very important breakthrough," she said.

Many observers, however, said the deal was far too weak. The UN Climate Change Secretariat says that the combined pledges will be too weak to achieve the target of limiting warming to the agreed goal of 2°C above pre-industrial levels.

Jennifer Morgan, global director of the climate program at the World Resources Institute NGO commented: "Every country needs to be doing more than they're currently doing in order to close the gap and stay below two degrees.

Morgan: "Every country needs to be doing more than they're currently doing"

"I think what Paris is about is keeping that two degree goal within sight, and every country doing more than it had planned to do anyway, and just stepping it up."

Lima was expected to advance in both of the negotiations work streams towards Paris 2015. Workstream-1 focuses on a climate regime that will be adopted in Paris and will apply after 2020, whereas Workstream-2 aims to raise the global level of ambitions in the pre-2020 period.

However, as most governments spent most of their time clarifying the main principles of Workstream-1, no significant progress has been achieved on Workstream-2.

Samantha Smith of the WWF conservation group said: "This leaves a huge amount for governments and everyone else to do in the next 12 months."

Others were also under no illusions as to the size of the task that lies ahead. Yvo de Boer, a former UN climate chief who heads the Global Green Growth Institute that helps developing nations said: "If so much blood flows negotiating the prenuptial, what does that mean for the marriage?"

Jake Schmidt, a climate talks expert from the Natural Resources Defense Council, a US environmental charity noted: "What we've seen in Lima shows Paris is not going to be an easy undertaking."

The Lima conference was not meant to negotiate the details of the Paris treaty itself. Potential components of the final treaty will be debated in detail throughout the coming year.

A negotiating text for the Paris agreement is due to be finished before May.

E.On responds to "altered" energy market

- Split to focus on renewables and customer solutions
- Problems in Brazilian JV will hit 2014 bottom line

Junior Isles

Citing dramatic changes in market conditions, German energy giant E.On says it will spin-off its conventional generation, energy trading and upstream activities into a new company, while retaining the existing company as a dedicated renewable energy business.

Chief executive, Johannes Teyssen said: "We are convinced that it's necessary to respond to dramatically altered global energy markets, technical innovation, and more diverse customer expectations with a bold new beginning. E.On's existing broad business model can no longer properly address these new challenges."

Teyssen says the traditional business model for utilities has "broken apart" after the German government in 2000 launched the transition to renewables, or *Energiewende*.

Mr Teyssen, stressed, however, that the main driver of change is not politics but technology that makes it easier for new players to enter the energy market, eroding the position of utilities as "system guardian".

With the likes of Google looking to invest in the sector, Teyssen said utilities need to be prepared for a new type of competition.

"Therefore, we want to set up our business significantly different. E.On will tap the growth potential created by the transformation of the energy world. Alongside it we're going to create a solid, independent company that will safeguard security of supply for the transformation. These two missions are so fundamentally different that two separate, distinctly focused companies offer the best prospects for the future."

Under the new arrangement E.On SE, the core business that will remain after the split, will have three core businesses: renewables, distribution networks, and customer solutions such as domestic energy-saving products.

The company said it would increase its investment in these areas by up to €500 million ($623.6 million), up from around €4.3 billion, with a particular focus on expanding its wind business in Europe and strengthening its solar business.

The new, as yet unnamed, spin-off company will continue to play a key role in supporting the renewables-focused E.On SE.

E.On expects to carry out the spin-off after approval at the E.On Shareholders Meeting in 2016.

Not all are convinced the move creates value for shareholders. Vincent Gilles, head of European utilities research at Credit Suisse said: "You've got a problem, and you split the problem in two. The assets are either not attractive to investors, or if they're about to rebound then you keep them."

Following the news of the E.On split, Moody's Investors Service announced a review for downgrade of E.ON's A3 rating.

The rapid expansion of renewables in Germany's electricity market has pushed down wholesale prices. This has hit E.On's profits, forcing it to announce an additional €4.5 billion in impairment charges in 2014.

The company has been strategically shifting its geographic focus, retreating from southern Europe's struggling market. In late November, according to media reports E.On SE was on the verge of selling its Spanish assets to Australia's Macquarie Group and Kuwait's sovereign-wealth fund in a deal worth €2.5 billion ($3.1 billion).

Before announcing the split, E.On had been shifting more operations to markets such as Russia, Turkey and Brazil, in a bet electricity demand will grow faster there than in Europe.

Its venture in Brazil, however, hit problems when Eneva SA filed for bankruptcy protection last month.

In 2012 E.On SE bought a 10 per cent stake in Eneva (then called MPX) from its owner Eike Batista for Reals850 million ($321 million). It bought a further 24.5 per cent from Batista for Reals1.4 billion in 2013, and invested Reals367 million more through a public capital increase. It currently owns 42.9 per cent of Eneva, while Batista owns 20 per cent.

E.On says the filing for judicial recovery by Brazil's largest private generation company would hurt its bottom line this year, but would not have a major impact on its earnings outlook.

According to Bloomberg, E.On has so far had to write off least €1 billion of the €1.3 billion it has invested in Brazil.

Existing capacity takes lion's share in UK auction

The UK's capacity auction has been hailed as a success but has failed to stimulate the level of new generating capacity that had been expected.

The auction undertaken by National Grid contracted 49.26 GW of capacity to provide backup power in the year 2018/19. The contracted amount falls slightly short of the intended 50.8 GW. All capacity agreements are subject to final confirmation from the Department of Energy and Climate Change (DECC), which is expected no later than 5 January 2015.

During the three-day auction, backers of schemes offering a total of 62 GW capacity were required to bid down the price from a maximum of £75/kW/year until a lower clearing price was established. The provisional result of the tender set a clearing price of £19.40/kW/year, which will be paid as a fixed sum to flexible power stations to guarantee their availability on top of any power they produce.

Phil Grant, a Partner in Baringa's Energy Advisory practice, which has advised the government on market reform and helped businesses prepare for the auction commented on the outcome.

"DECC and National Grid must be applauded for delivering this first auction in a complex programme of regulatory reform. No doubt other governments and regulators across Europe will have been watching with interest as the auction progressed, as many other markets face the same security of supply concerns and 'missing money' issues that GB does," he said.

The government hoped to encourage new gas-fired combined cycle power stations to be built under new 15-year contracts, and gas turbine plants accounted for 22.3 GW (just over 45 per cent) of the contracted capacity. However, many of the contracts have been awarded for only one year, with 68 per cent of the capacity to be provided by existing power stations. Only 5 per cent will come from new build.

Grant said: "A clearing price of £19.40/kW is below the annual fixed costs (e.g. salaries, connection costs, insurance, rates and ongoing maintenance) of most existing plant on the system, and certainly below the level that many potential new entrant plant had been hoping for."

Among the new projects approved is a 1.8 GW combined cycle gas turbine project in Trafford Park, Greater Manchester, by independent supplier Carlton Power under a 15-year contract. UK Power Reserve (UKPR) was the most successful independent distributed generator in the auction, securing more than 363 MW of new build, 15-year capacity market contracts.

"Undoubtedly some of the new entrant plant that were competing in this auction round, will return to participate in the auction in 2015 and there will be some important learnings from this auction for both policy-makers and developers to take into future auctions," said Grant.

The UK government has said interconnectors would be able to participate directly in auctions in 2015 to supply power in the winter of 2019/2020.

Utilities call for stable policies

A new report by the Global Electricity Initiative (GEI) states that a joint adaptation and mitigation approach, new energy storage technologies, and stable policies along with a meaningful carbon price will be required if countries are to deliver universal access while reducing emissions.

The report, drawing on the views of CEOs of utilities from countries which together account for about 80 per cent of global generating capacity, stresses that a meaningful price for CO_2 is crucial in facilitating significant change in the electricity sector's fuel mix.

Urgent action is required to help sustain the growth of renewables and other carbon-free technologies in meeting the rise in global energy demand, the report finds. On current trends, fossil fuels will continue to dominate, supplying between 77 per cent and 59 per cent of global primary energy mix by 2050, according to the report.

Notably, the report was released at COP 20 in Lima, Peru, indicating the growing recognition of the importance of business in the fight against climate change. It notes that providing a secure supply of electricity is utilities' top priority but says they are also focused on lowering emissions and minimising environmental impacts – despite contradictory signals and different priorities from regulators and customers.

Using Germany as an example Philippe Joubert, Executive Chair of the GEI, explained: "Policy makers are telling utilities they have to reduce emissions – [but are] increasing the use of renewables, without seeing the necessary changes in networks. After having abruptly decided to stop nuclear they are amazed that coal and lignite are back, as CO_2 is free and coal is cheap. On top of that the tariff structure is disrupted. Where is the rationale in all of that?

"At the same time, consumers are not prepared to pay higher tariffs for the changes in technology needed for lower emissions."

Commenting on the need for a global CO_2 price, Joubert said: "I do not think we will get a global price immediately. There will be country or regional prices. We are seeing a lot of interest from the financial sector led by the World Bank. Everyone believes it will come."

The GEI report is believed to be the first such work carried out on a global basis.

See page 3 for main findings

Main Findings ...

All GEI utilities point out that … **adaptation to current and future climate change is as important as mitigation** measures to avoid further climate change.

However, investments in adaptation research and development need to increase.

97% of GEI utilities agree that … **consumers are not willing to pay higher prices for non-carbon electricity** than for fossil fuel based electricity.

96% of GEI utilities indicate that … **energy storage technologies are a crucial success factor,** especially for growing share of renewable energy sources.

94% of GEI utilities report that … **security of supply is the priority implementation focus area**

78% of GEI utilities state that … **land requirement is becoming a major issue.** This could affect the development of new power generation projects and infrastructure.

81% of GEI utilities indicate that … **there is a regulatory requirement for energy efficiency in most countries** of operation.

In many countries, due to the economic climate and upward cost pressures from government policies to lower carbon emissions, utilities could have **difficulties to cope with further reduction in sales and loss of revenues resulting from energy efficiency policies.**

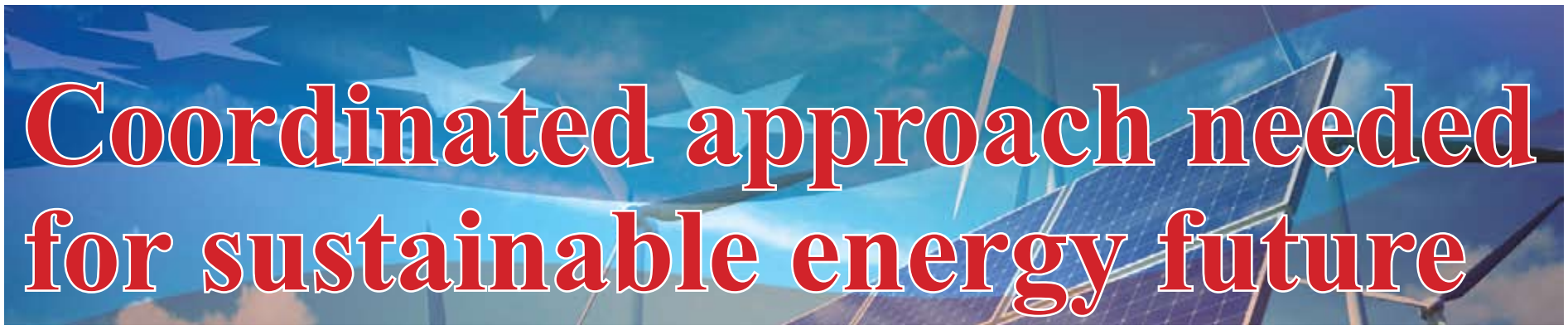
73% of GEI utilities believe that … **smart grids/smart meters are key for** smoothing the **integration of renewables.**

62% of GEI utilities are … **facing a challenge of integrating intermittent renewables into their electricity systems.**

However, there have also been a few success stories in Europe, North America and Asia.

61% of GEI utilities indicate that … **water requirements will increasingly be a challenge.** GEI utilities are working with key stakeholders and conducting water conservation initiatives to address this challenge.

44% of GEI utilities are … **evaluating the feasibility of Carbon Capture and Storage but do not consider it commercially viable** at present.



Coordinated approach needed for sustainable energy future

■ Greater coordination to encourage renewables integration ■ Common understanding on future of nuclear

Junior Isles

The United States is in a strong position to deliver a reliable, affordable and environmentally sustainable energy system, according to a recent report by the International Energy Agency (IEA). To do so, however, the country must establish a more stable and coordinated strategic approach for the energy sector than in the past.

Releasing the report – *'Energy Policies of IEA Countries: United States – 2014'* – IEA Executive Director Maria van der Hoeven said. "Long-term development of a sustainable electricity sector requires clarity. This means predictable, effective national policies to encourage investment, greater coordination to encourage the integration of renewables, and a common understanding on the future of nuclear power."

The report said the US natural gas boom has resulted in stable wholesale electricity prices, lower greenhouse gas emissions and greater system flexibility. But it also noted that the entire system is in need of significant investment if the US is to meet its electricity demand growth forecasts and strengthen resilience to climate change.

Specifically, there is a concern that competitive electricity markets may not trigger investments in large, high-fixed-cost investments with long lead times, such as nuclear, carbon capture and storage, and large renewable portfolio projects.

The report, which makes several recommendations for further improvement, came as the US made important announcements that will impact its nuclear and solar industries, as well as energy efficiency.

In mid-December, the Department of Energy's Department's Loan Programs Office (LPO) said it has opened solicitations in four areas, including the $8 billion Advanced Fossil Energy Projects Solicitation, the $4 billion Renewable Energy and Efficient Energy Projects Solicitation.

"With $40 billion of loan guarantee authority available to advance our 'all-of-the-above' energy strategy, the Department's Loan Programs Office has an opportunity to replicate its past successes, supporting innovative clean energy technologies that bring the US closer to a low-carbon future," said Energy Secretary Ernest Moniz.

"This solicitation will help the US build the next generation of safe and secure nuclear energy projects by providing the critical financing needed for innovations that have not been widely deployed at commercial scale in this country."

To date, LPO has supported a diverse portfolio of loans, loan guarantees, and commitments, supporting more than 30 projects nationwide including nuclear, wind and several of the world's largest solar generation and thermal energy storage systems.

Meanwhile, US manufacturers praised a decision last month to impose large import duties on solar energy equipment from China and Taiwan, saying it closed a loophole in import duties imposed in 2012 that allowed Chinese companies to sell at illegally low prices in the American market.

Mukesh Dulani, president of SolarWorld Industries America, the US arm of German solar manufacturer SolarWorld AG said: "These remedies come just in time to enable the domestic industry to return to conditions of fair trade."

SolarWorld, which led the campaign against cheap Chinese imports, said the decision would enable solar-panel makers to build new factories and create jobs in the US.

China's Yingli Solar, the world's leading solar panel manufacturer, expressed deep disappointment at the decision.

Robert Petrina , Managing Director of Yingli Green Energy Americas said: "It's well known that our customers, partners, and other stakeholders represent the majority of the solar industry and US jobs… This latest decision only perpetuates the uncertainty currently plaguing the American solar marketplace."

Chile attracts renewables investment

Chile's expansion of renewables is attracting significant investment.

Last month, German state-owned bank KfW said it will advance a €100 million ($123 million) loan for a 110 MW concentrated solar power plant being built by a unit of Spain's Abengoa SA. The European Commission will provide, through KfW, an additional €15 million from its Latin America Investment Facility aid programme.

According to the German government, the $1.2 billion project "will help prove the economic operation of concentrated solar power technology in the earth's sunbelt".

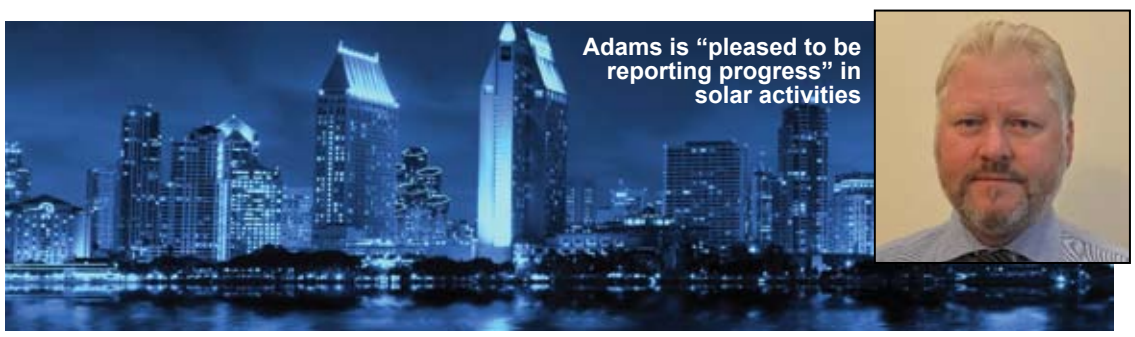
German Environment Minister Barbara Hendricks said: "Because it can store energy, this technology is also suited for basic electricity supply and therefore highly innovative."

Shortly after the announcement Chile's National Energy Commission (CNE) awarded 15-year power supply contracts to SunEdison for solar PV projects totalling 350 MW in the nation's latest energy supply auction. The company will invest roughly $700 million in building these projects.

According to figures from the government's renewable energy department, at the end of October Chile had 222 MW of operational solar PV capacity. The government has announced changes to boost investments in renewables and meet the country's target for them to provide 20 per cent of its energy supply by 2025. This has resulted in significant activity in the sector.

Rame Energy plc, the independent power producer (IPP), recently issued a progress report on its renewables activities in the country.

Rame CEO Tim Adams said: "In the first instance, we are pleased to be reporting progress to date on our first multi-megawatt on-grid solar project which builds on our off-grid solar work. Northern Chile is the ideal location for solar projects and, along with our first six wind projects in Chile totalling 133 MW, which are now at various stages of development, this project will play an important part in establishing a mixed portfolio of 300 MW within the next three years.



Adams is "pleased to be reporting progress" in solar activities

Green light for Site C dam

Construction of Canada's controversial $8.8 billion Site C hydroelectric dam is to begin this summer following approval by the government of British Columbia.

The dam would be the third on the Peace River in northeastern B.C., flooding an 83 km stretch of valley near Fort St. John. The 1100 MW project is expected to be complete and in operation in 2024 to deliver 5100 GWh per year.

Premier Christy Clark said the approval marks a historic milestone that will be felt for a century. "It was not an easy decision to come to. In order for our economy to grow, we need to ensure there is power."

The dam will bring clean, reliable and affordable power to the province, she added.

A new report says Canadian investments in clean energy totalled $6.5 billion last year, a 45 per cent increase from 2012.

Clean Energy Canada, an advocacy and research organisation, says more than half the investment, $3.6 billion, went into wind power. Another $2.5 billion was invested in the solar sector.

Brazil contracts nearly 5 GW

Brazil's government has awarded contracts for 51 power plants that will have a combined capacity of 4.98 GW and start supplying the domestic market in 2019. The total value of the power purchase agreements was Reals114.5 billion ($45.8 billion) and the contracts range from 20-30 years depending on the energy source.

Over 80 per cent (4 GW) of the total contracted power will come from 12 thermal plants. Most of the remaining amount was contracted to 36 wind farms with a total capacity of 925.9 MW (18.5 per cent).

Notably wind came in as the least expensive energy source, with an average price of Reals136 ($54) per megawatt-hour.

Several significant projects will be constructed under the contracts. Enel Green Power is to build the 114 MW "Morro do Chapéu" wind farm in Bahia State, in northeastern Brazil, where the company already manages approximately 400 MW of wind projects in operation or under construction.

The Italian renewable energy firm also said it has secured a $100 million loan from Itaú Unibanco to support the construction of more than 260 MW of wind power projects in Brazil. The 10-year term loan will be used to construct projects in Bahia, Pernambuco and Rio Grande do Norte in the northeast of Brazil.

Iberdrola and Neoenergia, through the joint venture Força Eólica do Brasil (FEB), also received a contract for the construction of three new wind farms in Paraíba state, each with a capacity of 30 MW.

There has, however, been a word of caution for wind power developers. According to a new Fitch Ratings special report entitled *'Demystifying Brazilian Wind PPAs: LEN vs. LER'*, the structures embedded in the different types of Brazilian wind power purchase agreements (PPAs) may influence the stability and predictability of a wind project's cash flow, providing distinct risks and mitigants.

Fitch describes the main differences between the two types of regulated wind PPAs: those related to Energy Reserve Auctions (LER) and New Energy Auctions (LEN or A-3/A-5). "There are relevant differences, such as exposure to energy spot prices, which may change the risk profile of a project quite significantly," commented Bruno Pahl, Associate Director in the Global Infrastructure and Project.

The ratings agency, however, also says the new energy spot price ceiling will reduce most Brazilian renewable energy projects' expenses on energy volume purchases by more than 50 per cent. "The decline in the ceiling will be particularly positive for wind and hydroelectric power projects," it stated.

■ SunEdison, Inc. and Renova Energia S.A. have created an exclusive joint venture to develop, own, and operate 1 GW of utility-scale solar photovoltaic (PV) energy that will supply the Brazilian Regulated Electricity Market. The joint venture will install 106.9 MW of solar by 2017 as part of contracts awarded by the Brazilian Energy Commercialization Authority, Camara Comercializadora de Energia Electrica (CCEE). The contracts were awarded in the 2014 Reserve Supply Auction (2014 LER), the first renewable energy auction in Brazil to specify a need for solar capacity.

Nuclear, solar central to cutting India's GHG emissions

- Nuclear pact signed with Russia
- Solar to increase five-fold

Syed Ali

Nuclear and solar are taking centre stage as India announced plans for new generating capacity that will help keep a lid on carbon emissions, while maintaining economic growth.

In mid-December, India signed an agreement to build at least 10 more nuclear reactors with Russia over the next two decades. The pact included a general framework accord and contracts to build two additional reactors at the Kundankulam nuclear power plant. The recently commissioned 1000 MW first unit at Kudankulam has already increased Indian nuclear electricity output by a fifth. Another reactor is due to begin operating this year.

After talks in New Delhi, Indian Prime Minister Narendra Modi said at a joint press briefing with Russian President Vladimir Putin: "We have outlined an ambitious vision for nuclear energy of at least 10 more reactors. It will have the highest standards of safety in the world, and also include the manufacture of equipment and components in India."

Putin was quoted by *Tass* news agency as saying that, apart from building new energy units at Kundankulam, Russia was waiting on the decision of the Indian government to allot a site for construction of a new Russian-designed nuclear power plant. "Our resources enable us to build up to 25 energy units in India," he said.

In addition to nuclear, a massive increase in renewables, particularly solar, will help India slow its increase in CO_2 emissions.

In early December, just ahead of the COP 20 climate talks in Peru, the government said it is taking bold steps against climate change with plans for a five-fold increase in solar capacity.

India's installed solar capacity has now reached 3000 MW, according to the latest ministry data, and the government has now upped its ambitions to increase solar capacity from a planned 20 GW in 2020 to 100 GW in 2022.

The country has doubled its coal tax to 100 rupees per ton and will use the money generated to further boost solar power capacity. Environment Minister Prakash Javadekar said it was a "huge increase" from the original plan and called it "a real game changer".

In late November, the Ministry of New and Renewable Energy (MNRE) identified 12 locations in various states for setting up 25 solar parks over the next five years to achieve 20 GW. Each park would host a plant with a capacity ranging from 500-1000 MW.

Indian companies are also considering investment in neighbouring Nepal's hydropower projects as part of an electricity trading pact signed in October between the two countries.

In late November, India signed a project development agreement with Nepal for the $1.04 billion 900 MW Arun III hydropower plant. India will import more than three-quarters of the power generated by the facility, which will commence operations by 2021.

Egat concedes more coal plant needed

The Electricity Generating Authority of Thailand (Egat) has confirmed Thailand will have to build more coal fired power plants to meet its energy needs since future supplies of natural gas are uncertain and renewable energy is expensive.

At present, 68 per cent of Thailand's electricity is produced from natural gas, nine per cent from coal and the rest from other fossil fuels and renewable energy.

The revised Power Development Plant (PDP) calls for 4400 MW to be produced from coal power plants by 2030. This would increase reliance on coal fired plants to 12 per cent in 2030.

In late November Egat said it has set aside Baht 61.5 billion ($1.87 billion) from 2015-18 to develop new plants and expand existing ones.

Egat's President Sahust Pratuknukul said nine plants with a combined capacity of 1613 MW are expected to start operations gradually between now and 2019.

The greatest potential for investment, it said, is the expansion of BLCP's coal-fired power plant at Map Ta Phut in Rayong to 1400 MW from 1000 MW.

"We're waiting for the Energy Ministry's Power Development Plan. If it gives priority to coal fired power, we can finalise the expansion plan," said Sahust.

Egat's Sahust expects nine plants to begin gradual operation

Japanese utilities expected to resume renewable purchases

Japanese utilities are expected to resume signing contracts to buy renewable energy this year after the government decided on measures to revamp its feed-in tariff system.

The scheme, under which utilities are obliged to buy renewable energy at fixed rates, hit trouble two years after its introduction as a result of new suppliers flooding into the solar power business and heightening concern that network overcapacity could cause blackouts.

As a result, five out of 10 major power companies recently suspended signing power purchase contracts.

Currently, power companies can ask suppliers to limit their output without paying compensation for up to 30 days a year. Under new rules taking effect this month [January], the 30-day cap will be abolished, the ministry said.

It was the second boost for Japan's utility solar industry within the space of 10 days. On December 9, Itochu Corp announced that it had secured a loan agreement with a group of financers represented by Mizuho Bank for a 37 MW solar plant to be built in Okayama.

The government of Prime Minister Shinzo Abe has pledged to increase the supply of renewable energy and reduce the country's dependence on nuclear power, while a revised national energy policy adopted in April last year places nuclear power as an "important base-load power source".

Japan's nuclear future came under threat following the Fukushima nuclear disaster in 2011, which resulted in the government taking the decision to close all of its nuclear plants pending new safety reviews. In November the first two of the countries 48 reactors were given the go-ahead to restart.

The restart of the country's reactors will be a welcome boost to Japan's utilities, which have seen revenues hit since the closures. Tokyo Electric Power Co. said last month it expects to record a pretax profit of Yen 227 billion ($1.9 billion) for the business year ending March on the strength of deeper cost-cutting, remaining in the black for the second straight year.

The operator of the disaster-hit Fukushima Daiichi nuclear plant, which faces massive compensation payments and costs for decommissioning work in connection with the plant, had not unveiled an earnings forecast for the year, citing uncertainties over its business outlook.

Australia plans network sell-off to boost economy

New South Wales (NSW), Australia's most populous state, says it will partially privatise its electricity network, in a move that could raise A$13 billion ($10.6 billion).

After hiring Deutsche Bank and UBS to study the viability of the sale, NSW said it would proceed with the long-term lease of 49 per cent of its electricity grid. The state has already sold its electricity generators and retailers.

The network is split into three assets: TransGrid, Ausgrid and Endeavour Energy. An initial public offering of Ausgrid and Endeavour Energy would be considered should market conditions indicate this would generate a better outcome than finding a single buyer, the government said.

The NSW electricity asset sale will go-ahead if Mike Baird's Liberal state government is returned to power in an election set for March 2015 – an outcome that polls see as likely. NSW's Labor opposition is against the sale.

Electricity transmission business Transgrid has been earmarked as the first of the NSW electricity assets to be put up for sale, to be offered on a 99-year lease. The government will retain full control of countryside electricity distributor Essential Energy.

Local media have reported that State Grid Corporation of China and China Southern Power Grid are among international parties eyeing electricity assets in NSW and Queensland, as well as consortiums of Australian and overseas pension funds.

A successful sale would be the largest so far in a nationwide push by conservative governments across Australia to privatise state-owned assets in order to boost a flagging economy. The country's budget deficit grew to A$48.5 billion in the year to the end of June 2014, up from $18 billion the previous year.

Last month politicians said the country would not contribute to the Green Climate Fund. Ahead of talks at the COP 20 climate summit in Peru, Australia said it will instead continue to directly pay for climate change mitigation in vulnerable South Pacific island nations through its aid budget.

Foreign Minister Julie Bishop said: "The Green Climate Fund is about supporting developing countries build resilience to climate change. Australia is already doing that through our aid programme."

Australia has been accused of setting a poor example for other countries by failing to contribute to the fund. Bishop's government has also been criticised for abolishing Australia's carbon tax.

Australia is among the world's worst per capita polluters due to its reliance on coal fired power and mining exports.

Last month Prime Minister Tony Abbott said, however, he was "open" to the idea of nuclear.

"I have no theological objection to nuclear energy and if we are to dramatically reduce emissions, we have to remember that the one absolutely proven way of generating emissions-free base load power is through nuclear.

"We want to reduce our emissions and we will... If someone wants to put a proposal for nuclear energy generation here in Australia, fine, but don't expect a government subsidy."

IEA calls for greater union in Europe's energy markets

A new European infrastructure fund could help tackle deficiencies in the bloc's energy markets identified by the International Energy Agency, writes **Siân Crampsie.**

A stronger 'energy union' must be created within the European Union if the region is to achieve its clean energy goals, the International Energy Agency (IEA) has said.

The IEA has praised the EU for progress on climate change policies as well as market liberalisation, but believes that further progress will require deeper market integration.

The IEA says that the EU's 20-20-20 targets have led to an "unprecedented boom in renewable energies" as well as lower energy intensity, but that the transition to a low carbon system outlined in new targets for 2030 would be a challenging process.

In October 2014 the European Council agreed to binding 27 per cent renewable energy targets and at least 40 per cent reduction in greenhouse gas emissions by 2030 compared to 1990.

The IEA believes that legal issues and new market rules are needed for these goals to be implemented.

"As member states adopt different energy policy choices and decarbonisation pathways towards 2030, a strong 'Energy Union' is needed to achieve the EU 2030 goals," said IEA Executive Director Maria van der Hoeven. "But let's be clear: such a union should not represent a buyer's cartel. Rather, it should feature an integrated energy market and effective climate and energy policies."

Among the IEA's recommendations are a call for greater interconnection of the energy network to help the integration of renewable energy, and stronger coordination of electricity system operation. It also said that energy interconnections should include all of Europe, and not just focus on particular areas of northern and western Europe.

"Much of the integration of Europe's energy market has been confined to northern and western parts of Europe, and that until important interconnections are built across the entire bloc, the EU will not have a truly integrated, single energy network – the basis for an 'Energy Union'," the IEA said.

Two key electricity interconnectors recently gained approvals in Europe. UK regulator Ofgem has given the go-ahead for Project Nemo, a 1 GW interconnector running from Belgium to southeast England.

In December, TenneT said that it would participate in the construction of the NordLink cable, a 1400 MW interconnector running from Germany to Norway.

The IEA has also recommended reforming the EU emissions trading system (ETS), diversifying energy supplies and maintaining a broad spectrum of energy sources, including coal and nuclear. It suggested complementing the ETS with policies to incentivise critical investment in low carbon technologies such as renewables, nuclear energy and carbon capture and storage (CCS).

"To make the most of the diversity of its energy sources, and to move towards an Energy Union, the EU must better pool its resources within the internal energy market to enhance both energy security and the competitiveness of its industry," added van der Hoeven.

Earlier in November, the European Commission announced a new €315 billion investment package aimed at helping the EU's economic growth prospects by funding key infrastructure projects.

The European Fund for Strategic Investments (EFSI), set up in partnership with the European Investment Bank (EIB), will focus on projects such as energy networks, energy efficiency, telecoms and transport.

Member states are already providing a European Commission-EIB task force with lists of potential viable projects for the fund, according to the Commission. Alongside the fund, the Commission will create a road map to identify and tackle barriers to investment, it said.

The European Council's conclusions in December 2014 noted that "fostering investment and addressing market failure in Europe is a key policy challenge", and said that investments under the new fund could be activated as early as mid-2015.

Finnish reactor project moves forward

- Parliament approves Hanhikivi 1 construction
- Fortum restructures TGC-1 venture

Russian firm Rosatom is to finance and supply a new nuclear power plant in Finland after the Finnish government gave its approval to a deal between Fennovoima and Rosatom.

The 1200 MW Hanhikivi 1 nuclear power plant in Pyhäjoki will cost $5-7.3 billion to build and is scheduled to start operating in 2024. Fennovoima said it was working with Rosatom to prepare the design work and construction license application, which they plan to submit to the government by the end of June 2015.

Parliament's approval of the project came after Fortum, Finland's biggest utility, said it would take a stake of up to 15 per cent in the project. Rosatom will own around 34 per cent of the plant.

Finland's four-party coalition government had insisted that 60 per cent of Fennovoima's shareholders must be Finnish and Fortum's participation means that threshold is likely to be reached.

The nuclear power plant project is highly controversial in Finland, with critics of the project concerned about moves to strengthen ties with Russia. In September, the coalition party Green League left the government in protest at the project.

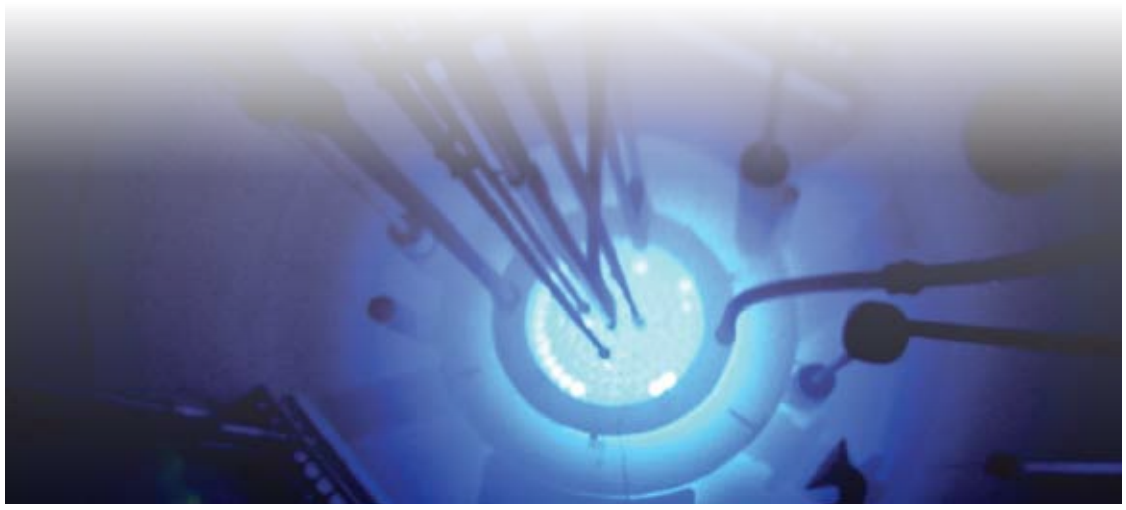
Fortum's decision to participate in the project is part of a deal struck in December with a subsidiary of Gazprom to increase cooperation in the nuclear and hydropower fields.

Fortum will restructure its joint venture with Gazprom Energoholding, which operates hydro and thermal power plants in northwest Russia and heating networks in St Petersburg.

The Finnish group, in which the government holds more than 50 per cent, will form a joint venture for the hydropower assets in which it will hold three-quarters while Rosatom will own the remainder.

Gazprom, which was the majority shareholder of the joint venture, will gain control of the other assets.

- Hungary has awarded contracts worth at least €6 billion to Russian state owned company Atomenergoproekt, a subsidiary of Rosatom, to build and maintain two 1200 MW reactors at the Paks nuclear power plant. The Hungarian government also passed a bill removing the need to hold a public competition and extending official secrecy on the project's terms to 15 years. This has prompted criticism of so-called "secret deals" with Russia from opposition politicians.



Spain mulls CCGT closures

Operators of gas-fired combined cycle power plants in Spain could be offered incentives to mothball their plants under a new decree drawn up by the Ministry of Energy.

The proposals are part of plans to help the country tackle its vast overcapacity, which developed because of reduced energy demand during the financial crisis and generous government subsidies for renewable energy. They would mark an about-turn for Spain, which currently operates a capacity market to ensure that there is enough reserve margin in place.

There are concerns that the proposed decree – which could be approved this month, according to ICIS – could leave Spain with inadequate back-up capacity. However it could also help to reduce system costs and reduce the country's tariff deficit.

Renewables output varies in Spain from less than 30 per cent of the generation mix to over 40 per cent. Renewables receive priority on the grid and combined cycle plants are called upon to make up the difference when renewable resources are not generating.

CCGTs account for just over 25 per cent of Spain's 108 GW of installed capacity, and renewables about 30 per cent. Peak demand is just 44 GW.

UK boosts CCS funding

The UK is hoping to boost investment in carbon capture and storage (CCS) through new initiatives and funding backed by the government.

The Department of Energy and Climate Change (DECC) has made an additional £2.5 million available to encourage the development of carbon dioxide (CO_2) storage in the North Sea. The funding will be sourced from the Innovation Fund and is designed to support the development of geological stores for the next phase of CCS projects in the UK. It will be delivered by the Energy Technologies Institute (ETI), which is already seeking partners to carry out the project.

The move would enhance the UK's competitive advantage in the CCS field, said the Carbon Capture and Storage Association (CCSA). "The UK is one of the best places in the world to develop CCS. Its unique geology – which could provide over 100 years of storage capacity – is optimally located to be used by the UK's major CO_2 emitters," said Luke Warren, CEO of the CCSA.

ETI said it was seeking partners to deliver the project, which will build on the work of its UK Storage Appraisal Project and CO_2 Stored – the UK's CO_2 storage atlas.

One of the UK's flagship CCS projects – the White Rose plant – made progress last month with the award of a development contract for its CCS transportation and storage elements.

National Grid Carbon has awarded a contract to Applied Drilling Technology International Limited (ADTI) for the front end engineering design on the wells required for the White Rose CCS project.

This latest contract award is for the design of a shallow water well envelope and special features to make the wells suitable for CO_2 storage. ADTI will also investigate material selection, programming and cost estimation.

White Rose is a proposed oxyfuel power and CCS demonstration project being developed by National Grid Carbon, Alstom, Drax and BOC. The project will capture about 2 million tonnes of CO_2 per year and store it permanently in underground rock formations beneath the North Sea.

Turkey's nuclear ambitions take shape

Turkey's nuclear power ambitions continued to make progress with two key announcements late last year.

Turkish Minister for Energy and Natural Resources Taner Yildiz has said that some construction of the Akkuyu nuclear plant in Mersin Province would start in April 2015.

The minister approved the environmental impact assessment report during a visit by Russian President Vladimir Putin.

JSC Akkuyu NPP, the Russian-owned company responsible for Turkey's first nuclear power plant, submitted an EIA for the project in July 2013, but had to send a revised version in April last year.

The first of the plant's four 1200 MW units is expected to be commissioned in 2021.

Meanwhile in late November, Westinghouse Electric Company, China's State Nuclear Power Technology Corporation (SNPTC) and Electricity Generation Company (EÜAS), the largest electric power company in Turkey, announced an agreement to enter into exclusive negotiations to develop and construct a four-unit nuclear power plant based on AP1000 reactor technology.

Public-private power gains traction in Nigeria

Nigeria's plan to use private-public partnerships to add new generating capacity is gaining momentum.

Last month the Federal Government signed a Memorandum of Understanding, MoU, for the construction of a 1000 MW gas fired power plant in Katsina State with Strancton Limited. It also signed another agreement with Greenville Oil and Gas Limited for the supply of liquefied natural gas (LNG) to the Kaduna power plant.

The Minister of Power, Professor Chinedu Nebo who signed the two separate MoUs on behalf of the government in Abuja, challenged other states to emulate the Katsina State initiative by tapping into the president's privatisation agenda in the power sector and investing in the industry in partnership with the private sector.

Speaking on behalf of the two companies, Mr. Edozie Njoku, CEO of Strancton Limited said the plant is the first gas pipeline-fed electricity project in Northern Nigeria between Katsina State Government and a consortium of General Electric, Vellbridge Oil, Gas and Natural Resources Limited and other private partners.

The Minister of State Mohammed Wakil said the signing of the MoUs is proof that the government's efforts in wooing investors are yielding positive results. Wakil said he was excited that the realisation of the project will bring Nigeria nearer to its target of 20 000 MW by 2020 as outlined in the country's vision document.

The power sector received a further boost last month with news that the African Development Bank (AfDB) is providing credit support to Nigeria Bulk Electricity Trader (NBET) in the form of partial risk guarantees for coal-based independent power plants.

With this risk guarantee in place, private investors can now invest in the development of coal fired power projects with the assurance that power from the plants would be paid for.

Nebo said that his Ministry was working with the Ministry of Mines and Steel Development to develop a bankable document for the purpose of facilitating investment in coal fired plants.

Nebo said the power sector has so far received several support bilateral partners in the form of loans amounting to about $2.771 billion. He noted that a committee on the development of coal-to-power has already facilitated the investments in coal fired power plants by Zuma Energy Limited and Pacific HTG Ltd. The Zuma Energy plant located in Kogi State will have a generating capacity of 1200 MW.

Small and medium enterprises are also being supported in the development of renewable capacity. Last month Germany, through the German Development Bank (KfW), extended a green credit line to Nigeria.

KfW pledged to support Nigeria's bid for renewable energy and energy efficiency with a grant of about $200 million (N33.6 billion).

Nebo commended Germany for the various projects undertaken in Nigeria, as well as its support for the Azura project.

At the start of December, Azura Power Holdings Limited signed the equity and loan financing documents for the financing of the 450 MW gas-fired plant. This is the first phase of a 1500 MW facility.

The Azura-Edo IPP is the first Nigerian project to benefit from the World Bank risk guarantees to support the mobilisation of private capital in the power sector in emerging markets world-wide

The project consists of the construction, operation and maintenance of an open-cycle power plant located in Edo State. It also includes the construction of a short 330 kV transmission line and an underground gas pipeline spur connecting the power plant to the country's main gas trunk line.

West Africa's power sector needs an estimated investment of $25 billion (N3.88 trillion) in 10 years to have a reliable and consistent power supply, according to the government.

South Africa moves to tackle power crisis

South Africa is to implement a five-point plan to tackle the worst power shortages the country has seen in six years. **Junior Isles**

South Africa has set up a 'war room' to oversee the implementation of a five-point plan to tackle its deepening power crisis.

The country is suffering its worst power shortages in six years due to creaking power plants and emergency maintenance. At the same time, Eskom is facing a $20 billion funding shortfall over the next four years, that is forcing the government to consider selling state assets to bail out the state utility.

The five-point plan drawn up on December 12, covers:

- The interventions that Eskom will undertake during the first 30 days;
- Harnessing cogeneration opportunities through the extension of existing contracts with the private sector;
- Accelerating the programme for substitution of diesel with gas to fire up the diesel power plants;
- Launching a independent power producer coal programme; and,
- Managing demand through specific interventions within residential dwellings, public and commercial buildings and municipalities through retrofitting energy efficient technologies.

In December the so-called Window 4 of its renewable energy bidding rounds invited bids for a range of renewable projects such as wind, photovoltaic, biomass and small scale hydropower. These will have a total capacity of 1000 MW and should be feeding power into the grid by 2017.

The government has already asked for bidders to submit proposals for the private coal fired programme, which will have a total capacity of 2500 MW. Winners of the programme, due to be launched at the end of this month, will enter into a power purchase agreement with struggling state utility Eskom.

At the same time, Public Enterprises Minister Lynn Brown said there was a need to look at the ongoing financial security of Eskom but stressed that did not mean there would be a bail out.

"This could mean guarantees, providing the space for Eskom to raise its own money – a combination of financial processes," she said.

Janine Myburgh, the President of the Chamber, said the best way to deal with the crisis at Eskom was to appoint a full-scale judicial commission of inquiry to find out what went wrong and how to fix it.

Last month Eskom reported a profit of R9.3 billion ($798 million) for the six months that ended on 30 September 2014 . This is down 24 per cent from R12.2 billion for the same period the previous year.

In addition to a lack of investment, Eskom's problems have been compounded by issues related to maintenance. In November a coal storage silo at the Majuba power station in Mpumalanga collapsed, resulting in power outages. At the same time, maintenance at the hydroelectric Cahora Bassa facility in Mozambique, from which Eskom draws power, has also constrained local power supply.

Although Eskom has 45 583 MW at its disposal, the utility can apparently only access as little as 24 000 MW due to "planned and unplanned" maintenance.

Commenting on the country's woes, electricity expert Doug Kuni said that all South Africans can do now about the current electricity situation is to buy candles and a generator. "You are going to need it for the next five to ten years," he said.

To meet the country's future energy requirements, the government is implementing an energy mix comprising coal, solar, wind, hydro, gas and nuclear energy.

In future biomass, wind power, solar power and hydropower will contribute 11.4 GW of renewable electricity to the grid, which currently depends on coal for 95 per cent of its power.

European utilities adapt to industry changes

Europe's utilities are adjusting their business models as renewables increase and profits continue to decline.

Last month the Norwegian government proposed to strengthen the equity in Statkraft SF with NOK10 billion (€1.13 billion).

The capital will be invested in hydropower, wind power, district heating and other renewable energy technologies. This will take place in Norway and Europe, as well as in growth markets in Asia and South America said the company.

"We are very pleased with the government's support for the company's strategy. Increased equity and a reduction in future dividends ensures predictability and underpins future growth within renewable energy," said chairman of the board of directors Olav Fjell.

The decision comes as Europe's utilities grapple with a rapid growth in renewables that is forcing some to alter their business models in order to sustain profits.

In response to Germany's shift towards green energy sources E.On announced last month it would split into two, spinning off power plants to focus on renewable energy and power grids.

The surge in demand for cleaner renewable energy, which is replacing gas and coal-fired power plants, combined with weak energy demand in a sluggish economy and low wholesale power prices has hit utilities hard.

RWE, E.On's main rival in Germany, recently reported that its revenue for the third quarter ended September 30, 2014 was €9.8 billion, compared to €10.53 billion for the same quarter ended September 30, 2013.

RWE said it would not follow E.On's move to split the company but said it had considered it two years ago. Instead it decided to divest its oil and gas unit, Dea.

"We had a look at splitting it up two years ago but didn't think it was a helpful solution for us in our circumstances," RWE Chief Executive Peter Terium said at a press briefing. "Instead," he added, "we decided to divest our E&P business Dea, which is a similar exercise with a slightly different outcome." The planned divestment to Russian investment group LetterOne is still awaiting approval from the UK government.

Meanwhile, in early December Czech utility CEZ said it will earn smaller profits in the coming years as it adapts to changes in the industry.

Central Europe's largest listed utility expects its adjusted net profit to drop to CZK29 billion ($1.29 billion) in 2014 from CZK38.8 billion in 2013, marking the fifth consecutive fall from a record CZK51.9 billion profit in 2009.

Daniel Benes, the company's Chief Executive said in a newspaper report: "We want to stand on two pillars: one is the coal and nuclear energy, the second the renewables and decentralised systems."

Terium looked at splitting RWE two years ago

CEZ scrapped a multi-billion tender to enlarge its Temelin nuclear plant last April after it failed to receive the price guarantees from the state. The company now awaits the government's new energy strategy.

Chinese companies use M&A to bypass trade disputes

Several Chinese companies are undertaking mergers and acquisitions (M&A) in response to international trade disputes with the US and Europe.

In late November, REC Solar announced an agreement that would see the sale of REC Solar ASA to Bluestar Elkem Investment Co. Ltd.

The Kr4.34 billion ($640 million) offer to buy REC Solar ASA, one of the last makers of solar panels in western hands, is seen as a move that may help circumvent trade disputes in the US and Europe.

China National Chemical's unit China National BlueStar Co. will complete the deal through a Norwegian unit, Elkem AS, which employs 2100 making solar-grade silicon and other alloys.

Commenting on the deal, Ole Enger, the Chairman of REC Solar said: "We are pleased that we today are in position to announce the combination of the Elkem Group and REC Solar… The Board believes that a combination with the Elkem Group will provide a strong platform to further develop REC Solar."

Helge Aasen, the CEO of Elkem AS, commented: "The Elkem Group has a strategic goal to grow its presence in the solar industry. The ambition is to establish a leading integrated PV player."

Xiaoting Wang, an analyst at Bloomberg New Energy Finance in Hong Kong noted: "Chinese companies will maintain their dominant position in the PV manufacturing industry by owning more overseas capacities. More of such cases are likely to follow, given Chinese companies have a need to bypass international trade disputes and to penetrate local markets."

More recently, Hanwha SolarOne Co., Ltd. (SolarOne), Hanwha Solar Holdings Co., Ltd. (HSH) and Hanwha Q CELLS Investment Co., Ltd. (Q CELLS) announced they would merge their businesses to create what they claim will be the largest manufacturer of solar cells with a capacity of 3.28 GW.

According to SolarOne and Q CELLS the merged businesses creates a company with a strategically diversified manufacturing footprint that provides competitive advantage. Significantly Q CELLS brings leading technology and manufacturing from Germany with a highly efficient and fully automated manufacturing base in Malaysia that is not subject to US and EU anti-dumping policies.

Under the agreement SolarOne will acquire 100 per cent of the outstanding share capital of Q CELLS from its sole shareholder, Hanwha Solar Holdings Ltd (HSH).

SolarOne is currently one of the world's largest solar wafer, cell and module makers with operations and manufacturing centred in China and more than 7500 employees across China, Germany and the United States.

Acquired by Hanwha Group in 2012, Q CELLS is the largest supplier of photovoltaic product solutions in Europe (based on global shipments in 2014 year-to-date), and has almost 1800 employees in Germany and Malaysia.

SolarOne brings a substantial manufacturing platform in China, with development of a new facility in Korea planned for this year. This broad manufacturing presence is expected to provide greater supply chain flexibility and resilience, allowing the combined company to reduce production costs, improve supply chain efficiency and be well positioned to navigate trade barriers.

China's nuclear companies eye overseas markets

China has put a focus on investing more in the UK since a visit by British Prime Minister David Cameron

- CNNC signs MOU with Fluor
- CGN buys stake in EDF wind farms

Junior Isles

China is preparing its nuclear companies for overseas expansion in both the nuclear and renewables sectors.

In December Global engineering and construction firm, Fluor Corporation signed a memorandum of understanding (MOU) with China National Nuclear Corporation (CNNC) to collaborate in nuclear and renewable energy developments, not only in China, but also for new opportunities in Europe.

The MOU, signed in Beijing by Fluor and CNNC representatives, paves the way to cooperate on a broad range of civil nuclear-related opportunities in the UK, Germany and China and the renewable energy market including wind farms and solar power projects.

"CNNC will work with Fluor to explore the full range of cooperation in Europe and China based upon the principles of mutual benefits, win-win and complementary of each other's strengths," said Qian Zhimin, president of CNNC.

Shortly after the announcement, a unit of China General Nuclear (CGN) Power Corp, China's other major nuclear company, said it acquired an 80 per cent stake in wind farms in the UK owned by EDF. It is its first move into renewables outside China, apart from a small investment in Australia.

CGN Europe Energy signed the deal with EDF's renewable energy division for the wind farms in eastern England, which together generate 72 MW.

CGN beat bids from several other generators for the wind farms near York, Newcastle and Peterborough, according to people in the industry.

As of the end of October, CGN had more than 10 GW of non-nuclear clean energy, including hydro and wind power. It operates 11.62 GW of nuclear power plants, accounting for more than 60 per cent of China's reactors.

China's government, however, sees scope for CGN and CNNC to expand through international expansion and is looking to merge its two biggest nuclear companies in order to capture overseas contracts.

Plans have already been submitted to the State-Owned Assets Supervision and Administration Commission to merge CNNC with CGN, said Xu Lianyi, a former government official and industry consultant.

The two companies were deliberately set up as rivals to compete for projects in China and abroad. But under government prompting, they have cooperated on a single reactor brand, Hualong I, with the intention of eventually marketing it abroad.

China has put a particular focus on investing more in the UK since British Prime Minister David Cameron visited Beijing on a trade mission in 2013.

Chinese companies are hoping to win contracts as the UK looks to build a new fleet of nuclear plants.

Some industry observers believe CGN's agreement to buy stakes in EDF's wind farms could help smooth talks on a larger deal with EDF to build Britain's first nuclear power plant in a generation, at Hinkley Point in Somerset. EDF is aiming to make a final investment decision early this year.

The Chinese companies have been pushing for a bigger role in the plant's construction and want a substantial share of the supply contracts, a demand that has complicated negotiations.

They also want ownership of another nuclear site, at Bradwell in Essex, with the aim of building their own reactor.

Americas

Mainstream wins Chile wind PPAs

Mainstream Renewable Power is among several European firms to have scooped power purchase agreements (PPAs) for renewable energy projects in Chile.

The National Energy Commission has awarded Mainstream 343 MW of capacity in a competitive tendering process. Mainstream will build and operate five wind farms for 15 years with its joint venture partner, Actis.

EDF and GDF Suez also won contracts in the tender. EDF will build a new combined cycle gas fired power plant in the Bio Bio region. GDF Suez-controlled E-CL will supply energy to Chile's SIC grid from new and existing power plants on the SING grid via a new transmission line linking the two grids.

Mainstream's five wind farms are the 33 MW Negrete, the 44 MW Alena and the 26 MW San Manuel project in the Bio Bio region, the 150 MW Sarco wind farm in the Atacama region and the 90 MW Aurora project in the Los Lagos region.

Mainstream and Actis unveiled their joint venture, Aela Energía in 2013. Their aim is to build 600 MW of wind and solar projects in Chile by 2016.

Hydro-Québec awards wind contracts

Hydro-Québec Distribution has accepted three bids totalling 446 MW for a wind power project.

The utility issued a call for tenders in late 2013 for the purchase of a block of 450 MW of wind energy. The average price of the accepted bids was 7.6¢/kWh, including 1.3¢/kWh for transmission costs.

The successful bidders were EDF EN Canada, Invenergy Wind Canada, and Systeme Energie renouvelable Canada Inc. Hydro-Québec says it is working with the project proponents to finalise the contracts.

Iberdrola wins in Salem

Footprint Power has awarded Iberdrola Ingeniería a contract to build a 674 MW combined cycle power plant in Salem, Massachusetts, USA.

Under the contract, Iberdrola Ingeniería will build a facility to replace the existing 63-year old Salem Harbor coal-fired power plant, which is being decommissioned on the site. The new plant will be equipped with GE technology.

Wärtsilä extends Goodman

Wärtsilä is to extend the Goodman Energy Center in Kansas, USA, for Midwest Energy Inc.

The Finnish firm will supply three 34SG engines to expand the capacity of Goodman from 75 MW to 104 MW. The power plant, consisting of nine engines of the same type, was initially supplied by Wärtsilä in 2008.

According to Midwest Energy, the extension will enable the plant to accommodate load growth as well as remain as a reliable source of back-up generation for wind energy resources in the region.

Abengoa boosts Argentina transmission

Gerdau has selected Abengoa to construct a new transmission line in central Argentina that will supply electricity to a new steel plant.

Abengoa will be responsible for the procurement, construction, testing and commissioning of 6 km of 220 kV double-circuit line, the extension of the Rosario Oeste transformer station and construction of a new 220 kV transformer station. The works will be carried out at sites close to the city of Perez, Santa Fe, and the project is expected to be completed within 12 months.

Asia-Pacific

ABB to strengthen Indian grid

ABB has won orders worth $55 million from public utilities, Bihar Grid Corporation Limited (BGCL) and West Bengal State Electricity Transmission Company Limited (WBSETCL), to build new transmission and distribution substations that will boost power supplies in the region.

As part of a turnkey contract in Bihar, ABB will design, supply, install and commission 220/132/33 kV gas-insulated switchgear (GIS) substations across four locations.

These substations will deploy ABB's compact high-voltage GIS technology which can reduce the substation footprint by up to 70 per cent compared with conventional air-insulated switchgear (AIS) substations. Other equipment includes medium-voltage switchgear, IEC 61850-compliant protection and substation automation systems, as well as fiber-optic telecommunications systems.

Hyundai clinches coal plant deal

Hyundai Engineering said that it has won an engineering, procurement and construction (EPC) contract to build a coal-fired thermal power plant in Indonesia at the cost of $325 million.

The project calls for building two 100 MW power plants in Tanjung in the province of South Kalimantan, Borneo.

The order was commissioned by Tanjung Power Indonesia, a joint venture between PT Adaro Energy, Indonesia's largest coal producer, and Korea East-West Power. The project will take 43 months to build.

PDB inks Bibiyana deal

Bangladesh's state-owned Power Development Board (PDB) has signed a contract with a Spanish-South Korean joint venture to implement the 400 MW Bibiyana South combined cycle power plant.

Isolux Ingenieria of Spain and Samsung C and T Corporation of South Korea will work together to carry out the engineering, procurement and construction (EPC) of the plant at a contract value of $288.26 million.

The plant will take 30 months to construct and will be fully operational in 2017.

Alstom secures Korean wind contract

DaeMyoung Energy Corporation has awarded Alstom a contract to provide wind turbines for the Gowon wind farm in Gangwon province, South Korea,

Alstom will supply and supervise the installation and commissioning of six of its ECO 110 Wind Turbines with 90 m towers, each with an output of 3 MW. When operational, the wind farm will have a capacity of 18 MW.

The Gowon wind farm was the second wind project secured by Alstom in Korea in 2014 and will be operational by the end of 2015. Korea has set a target of sourcing 20 per cent of its total electricity generation from renewable sources by 2020.

Europe

Nordex wins Knockduff contract

Green Energy Supply Ltd. has placed an order with Nordex for the supply of wind turbines for the 65 MW Knockduff project in county Cork, Ireland.

Nordex will deliver and install 26 of its N90/2500 wind turbines for the wind farm, which is scheduled to start operating in August 2015. It will also service the wind turbines for a minimum of 15 years.

Netze BW upgrades grid

EnBW subsidiary Netze BW has awarded Alstom a contract worth over €50 million to modernise its distribution network in Germany.

Alstom will build and upgrade four gas-insulated substations (GIS) in Stuttgart city centre and seven air-insulated substations (AIS) in rural areas. Alstom will supply the necessary equipment for the projects as well as carry out civil works.

The work is due for completion by 2017. It will enhance the performance and capacity of Netze's distribution network and enable it to cope with greater levels of renewable energy generation.

RP Global orders GE wind turbines

GE has announced that it will supply RP Global with 12 of its 2.85-103 wind turbines for the Rudine wind farm in Croatia.

The 34 MW project will be co-developed with Croatian wind pioneer Adria Wind Power, and will be located near the southern coastal city of Dubrovnik.

The wind farm – GE's first with RP Global and Adria Wind Power – will contribute to the Croatian renewable energy production goal to provide 20 per cent of the country's final energy consumption by 2020.

The wind farm contract will include a 15-year operation and maintenance agreement. The Rudine wind turbines will also benefit from GE's Salzbergen, Germany-based remote monitoring and operations centre, which monitors wind turbines in Europe and Asia.

Melfi I places order

WSB Group through its Italian subsidiary VSB energia verde S.R.L., has placed an order with Nordex for the supply of 10 turbines for the Melfi I wind energy project in southern Italy.

Nordex will supply eight N117/3000 and two N117/2400 turbines to the site, which is characterised by medium wind conditions. For this reason the wind turbines will be fitted with above-average sized rotors to achieve a high capacity factor.

CG wins Belgian offshore wind O&M contract

Avantha Group Company CG has been awarded a contract from the Belgian offshore wind farm operator Northwind to provide operation and maintenance services for the 216 MW wind farm offshore substation on the Lodewijk bank, 40 km off the Belgian coast.

CG will provide complete end-to-end services in order to effectively monitor, maintain and repair the offshore substation and ensure optimal availability and safety for 10 years. The remote surveillance and monitoring service operated by CG will include power adjustments and will secure the operation of the Northwind installations on a 24x7 basis.

International

Vestas receives Lake Turkana order

Vestas has received an order for the supply of 365 wind turbines for the Lake Turkana project in Kenya.

The order is the largest in Vestas' history in terms of number of wind turbines. The firm will supply its V52-850 kW turbines for the 310 MW project, which is expected to be Africa's largest wind power project when complete.

The order comprises supply, installation, and commissioning of the wind turbines as well as a 15-year Active Output Management (AOM 4000) service agreement. The logistically complex project is expected to be complete in 2017, Vestas said in a statement.

Nigeria signs solar deals

The Nigerian government has signed a memorandum of understanding (MOU) with three firms for the development of solar power projects.

Solius NGPC, Peoples Home Association and Solar Force Nigeria Ltd. say they could develop 1500 MW of solar energy capacity in the country, starting in 100 MW tranches in areas that have been identified by the government.

Access to develop Uganda's first solar plant

Access Power MEA, a power project developer focused on the Middle East and Africa, has been awarded a contract to develop Uganda's first solar power plant.

Through its subsidiary Access Uganda Solar Limited, the company will build, own and operate the 10 MWp solar photovoltaic (PV) facility in Soroti, Northeastern Uganda.

The $17 million project will benefit from Uganda's GET FiT solar facility, a dedicated support scheme for solar PV developments managed by KfW the German Development Bank on behalf of the Ugandan government and funded by the European Union Infrastructure Trust Fund.

The project is expected to reach financial close in June 2015 and commence commercial operations by December 2015.

Shamsuna signs up Trina

Trina Solar Limited has signed an agreement with Shamsuna Power Company for the design, build and operation and maintenance of the 10 MW Shamsuna solar project in Aqaba, Jordan.

The solar farm, located in the Aqaba Special Economic Zone will use 40 320 of Trina Solar's 250 Wp TSM- PC05A modules. Once operational, it will be the largest solar farm in Aqaba.

Trina Solar will provide operation and maintenance services at the plant for five years. Energy generated by the solar farm will be sold to Jordan's National Electric Power Company under a 20-year power purchase agreement (PPA).

Edison pencils Egypt MOU

Italian electricity and gas utility company Edison SpA has signed two memoranda of understanding for the construction of an 180 MW combined cycle gas turbine (CCGT) power plant in Abu Qir, Egypt.

The deals, signed with QALAA Holdings and Egyptian General Petroleum Corporation (EGPC), will strengthen Edison's presence in Egypt, which is attempting to modernise its electricity sector.

Oil

Crude prices not hit bottom yet

- Riyadh will not jeopardise market share
- Many see lower price range when market stabilises

David Gregory

In the days before Christmas key international benchmark Brent crude was selling in the $60/b range and West Texas Intermediate (WTI) had dipped below $55/b. Questions persist over how low the price might go and for how long it could stay down.

For now many forecasters are saying that oil has more ground to lose but none of them are prepared to try to predict how this will play-out even though many see prices remaining low well into 2015 at least. Furthermore, many see a lower range in which oil prices will fluctuate when stability returns to the market.

While a lower price for oil is good news for consuming countries and consumers, it will create serious problems for countries that rely on oil as a primary source of income.

Russia's economy is an example of how hard falling oil prices can hit an oil producing country's economy, although Moscow has the added burden of US and European sanctions as well as capital flight.

Iran and Venezuela, both Opec members, are also expected to see serious economic consequences from the declining oil price, and the longer the price remains low, the bigger the beating their economies will take.

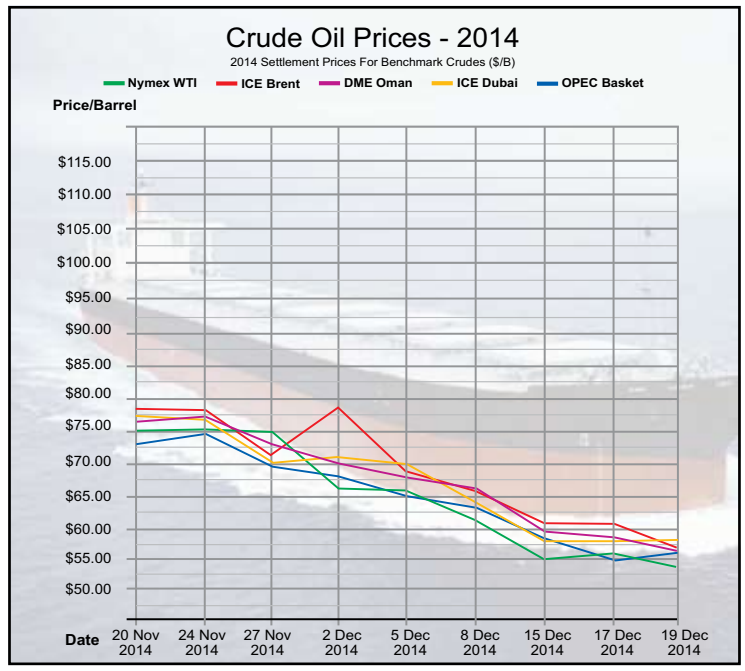
This reality has led to speculation that the US and Saudi Arabia are working in conjunction to hit their adversaries where it really hurts – in the pocketbook. Most analysts say the Saudi decision to maintain output, supported by their Persian Gulf allies, is directed at curbing US shale oil production.

Some also see it as a deliberate move by Saudi Arabia to put further pressure on Iran, which is already hit with international sanctions. With the violent upheaval in Syria and Iraq, Iran is seen as looking for opportunities to expand its influence in the Middle East and Saudi Arabia's stance on production is seen as a tactic designed to curtail Iran's ability to finance its quest for regional influence.

Saudi Arabia is adamant that a cut in production – which Opec members like Iran and Venezuela desire – that would cause Saudi Aramco a loss in market share remains out of the question.

Saudi oil minister Ali al-Naimi said it would be "difficult, if not impossible" for Riyadh to act in a way that would jeopardise its market share.

"In a situation like this, it is difficult, if not impossible, for the kingdom or for Opec to take action that may result in a reduction of its share in the market and allow for an increase in the shares of others at a time when it is difficult to exert control over prices. This would result in the loss of both market share and price," Naimi told the *Saudi Press Agency*.



He added that the market is experiencing "an incidental problem caused by the combination of several factors all at one time, including the slowdown of global economic growth significantly and increased oil supplies from several areas," particularly non-Opec areas were production costs are high.

Shutting down the high cost production by letting prices slip beneath the profit margin for those areas is seen as one rationale for Opec's decision in late November to maintain aggregate output at 30 million b/d.

For Opec members the problem is keeping the price at a level that will enable each country to meet its budget. While Saudi Arabia and the Gulf states have cash reserves that will allow them to cope with a readjustment in the range that crude oil prices might move in the future, members such as Iran and Venezuela do not. Serious cases such as Libya and Iraq, where wars are raging, can expect serious consequences if oil, as some analysts are predicting, eventually settles in a range of $50/b.

Saudi oil production declined during the month of October by 14 000 b/d to 9.69 million b/d, but exports rose 6.897 million b/d from 6.722 million b/d, according to data released by the Riyadh-based Joint Oil Data Initiative (JODI) in mid-December.

Gas

EU seeks alternatives in wake of South Stream demise

The demise of South Stream has given new impetus to gas import and transportation projects under consideration or in the early stages of development.

Mark Goetz

While in Turkey in early December discussing world affairs with Prime Minister Recep Tayyip Erdogan, Russian President Vladimir Putin announced that South Stream would be replaced with a new subsea gas pipeline across the Black Sea to Turkey and an onshore pipeline would be extended to the Turkish-Greek border, which would be the selling point for gas to Europe.

It is not entirely clear why Russia said it would scrap the South Stream gas pipeline project to Europe. A major obstacle was the fact that Russia was refusing to meet EU regulations that required South Stream to allow third party access, and the events in Ukraine had prompted the EU to stiffen those rules. Russia had pressed ahead with the plan all the same, proceeding with plans to construct the onshore section of the pipeline through Bulgaria and Serbia as if EU approval would ultimately be given.

Cost was another obstacle. Estimated investment in the pipeline was put in the range of $15-25 billion. Some estimates to build the 900 km deepwater pipeline across the Black Sea went up to $40 billion, and with US and EU sanctions in place, financing the project could have proved impossible.

The demise of South Stream has given new impetus to gas import and transportation projects under consideration or in the early stages of development in EU member states in Southeast Europe.

In early December eight ministers from Central and Southeast Europe met in Brussels with new EU Vice-President for Energy Union Maros Sefcovic to discuss how those states might interconnect their gas systems thus ensuring energy security with bidirectional pipeline systems.

During the gathering the energy ministers of Greece, Bulgaria and Romania signed an agreement to connect their natural gas pipeline networks to create a 'vertical corridor' that would allow the north-south flow of natural gas in Southeast Europe.

The plan is in line with an EU initiative to establish greater energy interconnectivity among EU members.

Greece and Bulgaria already plan to connect their gas grids through the Interconnector-Greece-Bulgaria (IGB) pipeline. A final investment decision on the €200 million project will be taken within the next few months and EU financing is expected to contribute to its construction.

The IGB will have 3-5 bcm/year capacity and so would the vertical corridor, which would be supplied with gas delivered through Greece's existing LNG terminal at Revithoussa and through the Trans Adriatic Pipeline (TAP), which will be transporting gas from Azerbaijan as part of the Southern Corridor. Another supply point could be established with the installation of a floating storage and regasification unit (FSRU) in the northern Aegean, named the Aegean LNG project.

The vertical corridor is considered an EU Project of Common Interest (PCI) and could be operational as early as 2017. The possibility exists that it could be extended to other EU members in the future.

EU members Greece, Italy and Cyprus have requested EU financial support for a feasibility study to determine whether the proposed East Mediterranean Gas Pipeline is a viable means of transporting Israeli and Cypriot gas to Europe. It too is listed as a PCI and is supported by Greece's public natural gas company DEPA and Italy's Edison, which have formed the IGI Poseidon joint venture (Interconnector-Greece-Italy). A contract for the feasibility study is due to be awarded shortly.

The East Med pipeline would stretch some 1500 km from offshore Israel to Cyprus to Crete and then to the Greek mainland. From there it would cross into southern Italy via a subsea pipeline across the Adriatic Sea. It would have the capacity to transport between 8-12 bcm/year of natural gas produced offshore Israel and Cyprus.

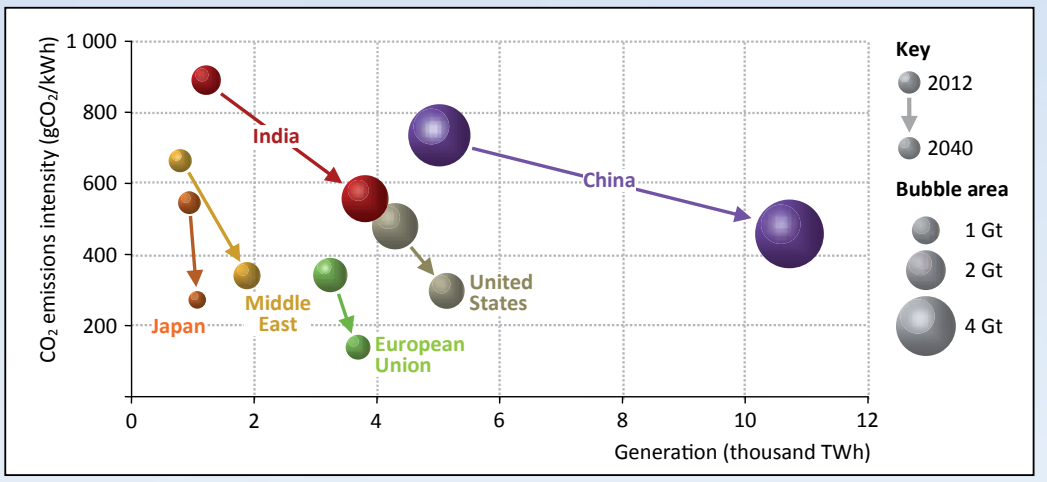
South Stream's exit from the scene – for now at least – has prompted Croatia to revive plans to establish an onshore regasification facility at the deepwater port of Omisalj on the island of Krk in the Adriatic.

Croatia plans to launch a new feasibility study for a terminal with a 4-6 bcm/year capacity and it aims for financial support from the EU and the US. The project would require an investment of some €600 million and it could supply gas to Hungary, Slovenia and Serbia.

Talks have already taken place between Croatia and Poland to link the pipeline systems and thus connect the Krk terminal with Poland's 5 bcm/year LNG terminal at Swinoujscie on the Baltic Sea, which is due to start operating in 2015.

The plan would help to reduce Eastern Europe's dependence on Russia gas. Poland relies on Russia for two-thirds of its gas supply.

Electricity-related CO_2 emissions and carbon intensity of electricity generation in the New Policies Scenario



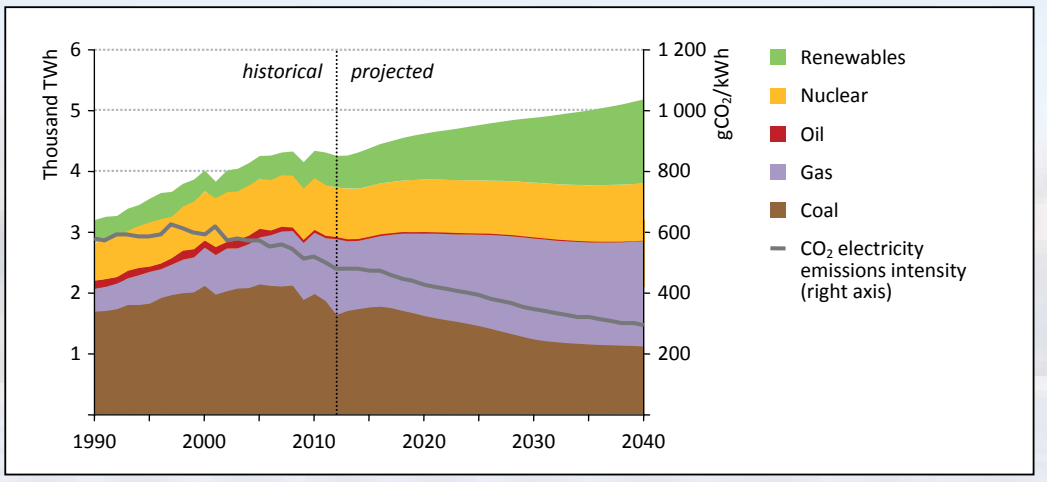
World Energy Outlook 2014 ©IEA/OECD, Page 226 Figure 6.15

For more information, please contact:

International Energy Agency
9, rue de la Fédération
75739 Paris Cedex 15
France.

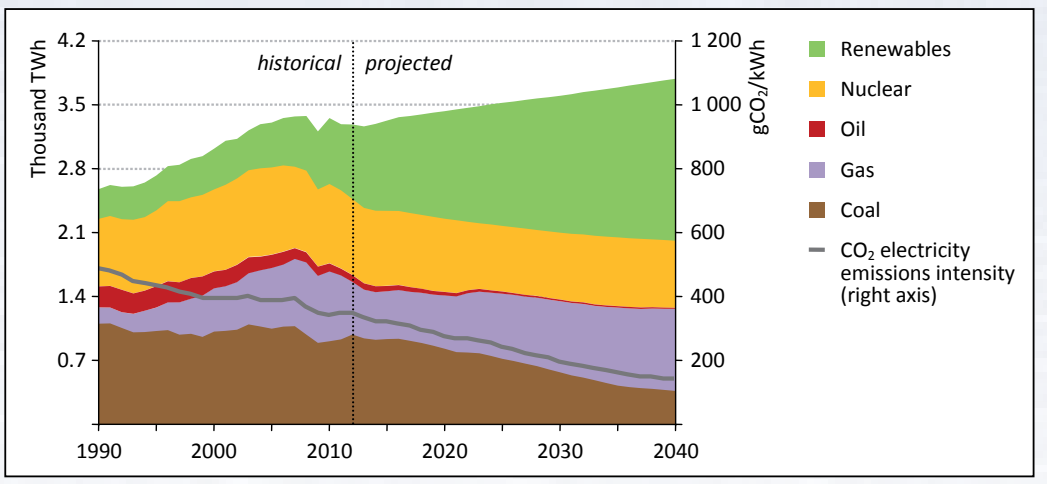
Email: bookshop@iea.org
website: www.iea.org

United States electricity generation by source and CO_2 intensity in the New Policies Scenario



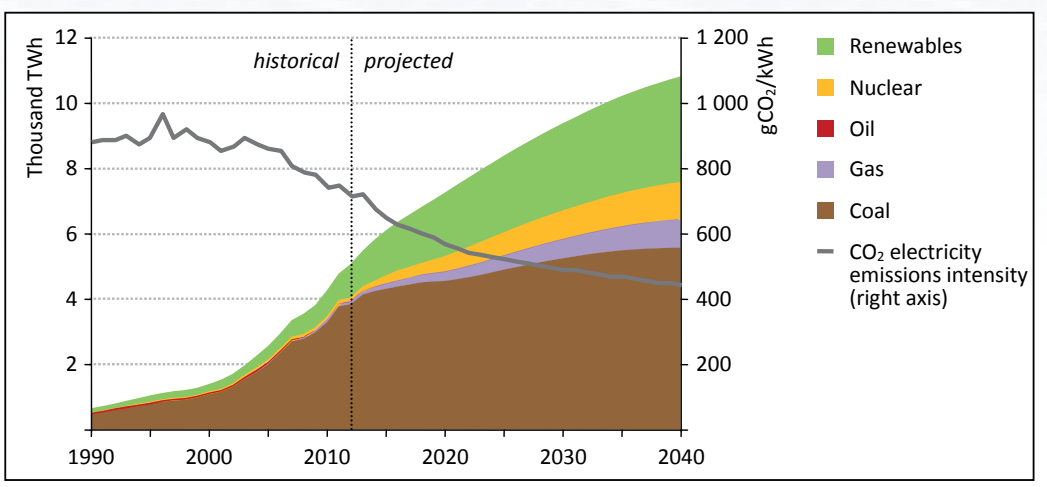
World Energy Outlook 2014 ©IEA/OECD, Page 230, Figure 6.18

European Union electricity generation by source and CO_2 intensity in the New Policies Scenario



World Energy Outlook 2014 ©IEA/OECD, Page 232, Figure 6.19

China electricity generation by source and CO_2 intensity in the New Policies Scenario



World Energy Outlook 2014 ©IEA/OECD, Page 234, Figure 6.21

Source: World Energy Outlook 2014

What does 2015 hold for bioenergy?

It is an interesting time for the bioenergy sector. It will tease out new initiatives, different feedstocks that will lead to more innovation and better margins for industry, says **Dr Dan Wright**

The majority of people, even now, still think of the bioenergy sector as 'one thing'. Yet it ranges from massive co-fired coal power stations all the way down to domestic systems, transport fuels or bio-chemicals. This makes it extremely difficult for policy to adequately cover all these different dimensions and that in turn can limit innovation in the bioenergy sector.

Nowhere is this truer than the UK where we have the largest percentage increase required of all EU member states to meet the 15 per cent renewable energy target by 2020 – we are currently at 5 per cent. Recent statistics also show the UK National Grid has approximately 4 per cent spare electrical generation capacity compared with 17 per cent in 2011.

These are worrying figures but present an opportunity to look at increasing the generating capacity of energy from renewable sources. It provides a unique 'opening' for not only EU technology providers to become established within the UK, but also for a myriad of companies within the bioenergy value chain to capitalise on the £12 billon ($18.5 billion) of bioenergy investment required for the UK to meet its target.

Globally it is hard to ignore the decline in fossil fuel prices and, if this continues in 2015, it could harm the bioenergy sector in its current form. Margins are quite low on producing electricity and heat for a typical virgin bioenergy system and any investment decision requires squaring up to the 'old kid' on the block: fossil-fuel derived energy.

However, bioenergy should not be compared to solar, wind or tidal power – the more commonly known forms of renewable energy. Much attention has focused on renewable electricity production but it is only bioenergy that has the potential to generate the large gains required in renewable heat and we need to recognise its potential.

It's not all bad news though. As a sector we are more resilient than most in the face of increasing competition. Higher cost materials such as virgin wood pellets or wood chips for a biomass boiler or a small-to-medium size CHP (combined heat and power) system will need to address efficiency issues around heat use and distribution. The often overlooked, locally produced biomass residues – for example, biological municipal waste – will quickly improve the economics of a bioenergy scheme by reducing the largest operational expense.

Wright says the sector is "more resilient than most" in the face of increasing competition

It's an interesting time for the bioenergy sector. It will tease out new initiatives, different feedstocks that will lead to more innovation and better margins for industry.

There is an important role for bioenergy across the electricity, heating, transport and chemical sectors. However, this needs to be done sustainably, especially in relation to the choice of biomass feedstocks. It's getting better but is probably not as stringently controlled in some areas as others. The wood pellet market has an industry-led sustainability plan that allows developments to progress whilst the liquid fuels equivalent appears harder to implement.

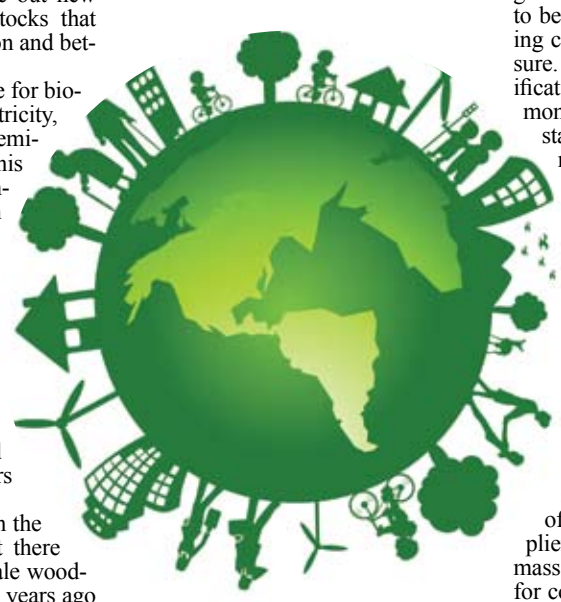
One of the big changes in the past 12-18 months is that there are now very few large scale wood-only power stations. A few years ago there was about 30 planning applications in progress but partly due to a favouring of coal to biomass conversions these have fallen by the wayside. A similar hiatus now seems to exist for waste incineration projects that are held up due to uncertainty around the future of the technology, the resource and the introduction of new more efficient conversion methods and management techniques.

The future for the bioenergy sector – at a global level, and whether in 2015 or perhaps a little later – will be the transition to a broader 'bio-based' economy. This means that we will aim to extract maximum value from biomass by transforming it into higher value products such as platform chemicals, solvents and fuels. This approach mirrors the development of the oil industry where refineries have been developed to convert crude oil into a range of products. The development of bio-refineries that can replicate this approach for biomass is a logical path but has its own characteristics and challenges.

European Commission research funding streams such as Horizon 2020 confirm this shift in the way biomass is being viewed. Working to get the most we can from it is at the very forefront of our focus at the European Bioenergy Research Institute (EBRI). At a European level bioenergy is becoming more accepted as a mainstream renewable energy source.

On the electricity supply side bioenergy provides a much less intermittent and more dispatchable form of renewable energy than wind or solar and, along with energy storage at both grid and consumer levels, can play a key role in balancing supply and demand without using higher carbon emitting energy sources.

There is support for more advanced forms of bioenergy in the UK, such as pyrolysis and gasification, the sort of technologies that we research at EBRI. However, through our research in other European countries, such as France, we see that there are no incentives for these technologies. Across Europe there should be more support for more advanced technologies to push innovation from research to market. In the UK we would also welcome a clear renewables roadmap and low carbon



targets based on European law. The Emissions Trading Scheme (EU-ETS), having floundered over the past few years, can quickly support renewables in light of falling fossil fuel prices.

We have seen that policy set at a UK level, predominantly for production incentives, has been looked on with some envy by our European partners for the breadth of technology and feedstock support. An example of this is the 2011 Renewable Heat Incentive (RHI), which has greatly increased the uptake of heat-led systems and promoted the more efficient use of heat from CHP systems by directly incentivising the use of heat from biomass (excluding liquid fuels).

Many EU countries indirectly incentivise the use of renewable heat using electricity production incentive mechanisms, such as in Germany where biogas to grid injection incentive has to be linked to CHP generation elsewhere. Under the RHI, there is a fixed tariff for direct biogas to grid injection that is supporting rapid growth within the UK.

In the coming year, we will see ever increasing interest in organic residues, especially Refuse Derived Fuel (RDF) and RDF gasification projects. Under the UK Contracts for Difference energy legislation aimed at larger scale renewables, gasification of biomass is well supported for the first two years and then that support drops off slightly, probably because the British government thinks it will be commercially viable by 2017. We will see a lot of action on new proposals in 2015-16, which in turn could spark an increase in similar projects and collaborations in Europe and beyond.

If gasification projects are to play a significant role in the future bioenergy mix then the coming 12-24 months are crucial. For developers to make best use of the more generous offers under Contracts for Difference, projects need to be in progress or starting to be developed in 2015. Any later and those projects are not likely to be commissioned in time to benefit from the higher strike price auction round.

The ancillary equipment around gasification technologies all appears to be ready but the long-term operating costs and reliability is a little unsure. There is a lot of interest in gasification; it's a hot topic at the moment across the EU member states but comes with significant market and technical challenges.

Taking into consideration some of the key developments in 2014 the large scale power from the biomass sector appears to have settled on co-firing conversions as the best avenue for new capacity rather than dedicated new build biomass combustion plants.

E.On's Ironbridge plant and the successful, yet short lived, trial at RWE's UK Tilbury show an ongoing commitment of the large European energy suppliers to convert from coal to biomass as the most feasible exit route for coal stations falling foul of pollution limits in the Large Combustion Plant Directive. Whilst uncertainty in policy may have relatively settled down, market uncertainties and realities are now causing some conversion investments to pause for thought.

At least four proposed coal to biomass conversions have been announced by UK generators, and if all go ahead these alone will create a demand of around 17-20 million tonnes of wood pellets each year. The total 2012 market for wood pellets in the whole EU was just 14 million tonnes.

Although significant resource and capacity increases are available in EU nations the major investments in the supply chain of pellets have been in North America where the supply market is healthy. The US benefits from well-established blue-chip landowners, a lack of domestic competition from paper or energy industries, experienced practitioners, and a surplus of supply partly due to the ongoing mitigation measures for North American Pine Beetle infestation. In the last 12 months the demand side of the equation has started to take shape, but uncertainty in the supply side has been revealed and this will be a key consideration for 2015.

Interestingly, through EBRI's work with businesses in and those considering the benefits of bioenergy, we find that our discussions are rarely about bioenergy being a 'nice if you've got the money' option but an economical and competitive solution to the status quo.

Dr Dan Wright is a Research Associate within European Bioenergy Research Institute (EBRI), Aston University, United Kingdom.

Leading nuclear through risky terrain

Both the International Energy Agency and Moody's Investor Services have highlighted the risks associated with nuclear power but the UK's Hinkley Point C has the potential to turnaround some of the negative risks facing operators in some countries.

Junior Isles

According to the International Energy Agency (IEA), in 2013 the world's 392 GW of installed nuclear capacity accounted for 11 per cent of total electricity generation – a share that has gradually declined since 1996, when it reached almost 18 per cent.

In its *World Energy Outlook (WEO) 2014*, the IEA forecasts that nuclear installed capacity will grow by 60 per cent to 2040 in its central scenario, with the increase concentrated heavily in just four countries (China, India, Korea and Russia). It notes, however, that despite this growth the share of nuclear power in the global power mix will remain well below its historic peak.

While nuclear power plays an important strategic role in enhancing energy security and cutting CO_2 emissions in the power sector, it faces major challenges in competitive markets where there are significant market and regulatory risks, adds the IEA.

The IEA's findings were largely supported by a recent report by ratings agency Moody's Investors Service (MIS), which takes a closer look at the risk profile of nuclear power in several countries and the impact on operators. The report, *'Global Nuclear Generation Prospects Power Up in Asia but Power Down Elsewhere'* examines the prospects for nuclear generation in seven markets – China, South Korea, Japan, the US, the UK, France and Germany – and the effect of nuclear generation on the credit quality of the utilities operating within them.

The report offers some valuable insight at a time when several countries around the world are either building or considering new nuclear plants.

According to MIS, operating a nuclear plant is usually credit positive for most utilities. Although expensive to build, once in operation, nuclear plants typically provide large-scale and reliable sources of electricity generation and profits in many energy markets. This is due to their operation as baseload generating units that are usually economical from a marginal cost-of-power standpoint.

Competitive and political factors can, however, have negative credit implications, says the report. For example, in the US the two largest nuclear generation companies – Exelon Generation Company (Baa2 stable) and Entergy Corporation (Baa3 stable) – operate plants in competitive, wholesale power markets where low power prices have severely hurt margins and caused them to consider the permanent retirement of some plants.

Meanwhile, in Germany the mandated shutdown of all nuclear power plants following the Fukushima disaster in Japan has negatively impacted utilities. According to Moody's, the ownership of nuclear reactors is credit negative because gradual shutdowns will decrease the utilities' cash flows.

Furthermore, today's low power prices, higher fuel costs and Germanys' nuclear fuel-rod tax on all reactors compound the adverse effect on power plant profit margins and credit ratios, such as funds from operations to net debt. E.On SE (A3 negative) owns 45 per cent of the country's current fleet of nuclear reactors, RWE AG (Baa1 stable) owns 26 per cent and EnBW Energie Baden-Wuerttemberg AG (A3 negative) owns 21 per cent, with the remainder owned by Vattenfall AB (A3 stable) and several municipalities.

Yet while the impact of owning existing nuclear generation is important, what of those hoping to build new units? MIS points out that building a new nuclear plant increases business and operating risks. The scale, scope and complexity of new nuclear projects can lead to a high degree of uncertainty about both the ultimate costs and potential rate increases necessary to recover these costs, it said.

In addition, the long construction time exposes the utility to long-term changes in technology, market conditions, regulatory and political viewpoints, or other factors that could alter the economics of building a new nuclear plant.

In the US, only two new plants are under construction. They are owned by regulated utilities Georgia Power Company (A3 stable) and South Carolina Electric & Gas Company (SCE&G, Baa2 stable). Construction of both plants has been delayed up to three years, and the plants are unlikely to come on line until 2018-20 at the earliest. In addition, federally owned Tennessee Valley Authority (TVA, Aaa stable) is in the process of completing one nuclear reactor that it originally began building in the 1970s but later abandoned. This plant has also been repeatedly delayed, and TVA expects it to reach commercial operation in late 2015. For all three, the credit implications of these nuclear construction projects have been and might continue to be negative, said MIS.

Meanwhile, in France the completion date of EDF's new Flamanville European Pressurised Reactor (EPR) has been postponed by five years (now to 2017). MIS states the development of this project is credit negative for EDF and further exacerbated by cost overruns from an initial construction cost of €3.3 billion to a current estimate of €8.5 billion. This might be revised upwards again following the announcement on November 18, of a shift in the construction schedule.

With ongoing delays and cost overruns at Olkiluoto in Finland, the risks associated with new build and how they can be overcome is currently a hot topic in Europe. Following Fukushima, several countries decided to either phase out nuclear or put a moratorium on new plants.

However, some still have new build plans in place, or under consideration – the most ambitious of these being in the UK. The UK has one of the oldest nuclear fleets in the world and its 2013 Nuclear Industrial Strategy proposes building 16 GW of new capacity by 2030.

Its first new nuclear construction project in decades moved a step further in October 2014, when the European Commission said that, subject to a number of amendments, it would approve state aid for the Hinkley Point C project in the form of a contract for difference and a guarantee for part of the project's financing.

The project is of significant interest to the industry, as many believe it offers a model of how new nuclear plants can be financed and built.

According to Moody's the development of the new Areva EPRs at Hinkley Point will, however, present challenges for EDF given the long lead-time for construction. It cited the delays associated with constructing the EPRs in Flamanville and Olkiluoto as examples.

The long lead-time for construction, during which there is no cash-flow generation, would weaken key credit ratios such as funds from operations to debt and retained cash flow to debt, said the report. EDF is seeking to mitigate risks at Hinkley C by undertaking the project in a consortium with other investors.

The report stated, however, that although the contract for difference and guarantee would partially mitigate some of the risks associated with the project, a number of uncertainties remain that could delay financial close.

Vincent de Rivaz, Chief Executive of EDF Energy gave an update on Hinkley Point C at the 'Nuclear – Powering the UK' conference organised by the Nuclear Industry Association (NIA) in London in December.

He noted that building new nuclear has "never been easy" and that the process of nuclear new build was "being restarted after a long pause". He said the need to re-learn how to build new plant was one reason for the delay at Flamanville, which in December saw its schedule pushed back one year to 2017.

He told delegates that the lessons learned from Flamanville, and successful EPR project construction in China, would benefit Hinkley. He also maintained that the proposed nine-year construction schedule is "realistic".

Mr de Rivaz also said that the cost of Hinkley Point C "has not increased by one penny" as a result of the delay at Flamanville.

Regarding the reported uncertainty around Hinkley Point's financing, de Rivaz commented: "There has been a lot of speculation around our negotiations with our Chinese partners. Let me be clear, as someone who is actually in those negotiations, they are progressing as expected… of course we are also talking with other potential investors. These partnerships could open more opportunities for the UK." He said that the financial close for the final investment decision (FID) is "nearing". The FID is expected during the first quarter of 2015.

Mr de Rivaz noted that Hinkley Point C presents opportunities as well as challenges. "Next year [2015] will be testing but we can do it," he said.

This will be an important year for the UK and the nuclear industry. Many are watching as EDF inches towards a commercial investment decision.

UK nuclear company, NuGen, a joint venture between Toshiba and GDF SUEZ, is working on its Moorside project – a nuclear power station of up to 3.4 GW in West Cumbria based on Westinghouse's AP1000 reactors. On December 2 the company announced the signing of a co-operation agreement with HM Treasury to promote financing of the project.

Also speaking at the London NIA conference, NuGen's CEO Sandy Rupprecht said it is targeting a 2024 operational start date for Moorside. He noted, however, that the biggest uncertainty is not the technical aspect.

"Watching EDF, which has ploughed the ground in front of us, there are some challenges. We need to look at how we can shorten the FID period. There's a new European Commission and we will have to go through another state aid study. But there are some great opportunities to take advantage of the case just made – the CFD, treasury guarantee, etc. One of my concerns, looking to government to make sure we get to 2024, is how we can take some of those commercial aspects and make them better, faster and cheaper."

There is a lot riding on Hinkley Point C. MIS' outline of the credit risks for nuclear operators, especially in deregulated markets, are clear but a positive outcome for EDF and Hinkley could go a long way to turning those ratings around.

Vincent de Rivaz: building new nuclear has "never been easy"

Geothermal meets biomass at Cornia 2

A pioneering project is now under way in Italy that will use a new biomass boiler to heat geothermal steam in order to increase the energy efficiency and electricity output of an existing geothermal plant. **Junior Isles**

The Cornia facility will be the first to integrate geothermal and biomass technologies

Deambrogio says the plant "maintains the total renewability of the resource and the cycle"

Castelnuovo Val di Cecina is a medieval town in the Province of Pisa in the Italian region of Tuscany, about 70 km southwest of Florence and roughly 70 km southeast of Pisa.

The town is situated in an area of significant geothermal activity. In 1994 Enel Green Power (EGP) built a 13 MW geothermal plant close to the town, known as Cornia 2. Following 20 years of operation, in November last year EGP announced that it had begun construction of a biomass power plant next to the geothermal project. When complete, it will be the world's first renewable energy plant to combine geothermal and biomass.

According to EGP, the decision to build this world-first makes sense on several levels, noting that integrating different technologies can "create a better whole".

Roberto Deambrogio, Head of Europe, EGP, explained: "The hybrid we are constructing at Cornia 2 will be the first plant in the world that uses biomass to heat geothermal steam in order to increase the energy efficiency and electricity output of the geothermal cycle."

Combining two technologies to produce electricity from renewable sources at the same location not only increases the generation of zero-emission energy, but also makes it possible to use the same infrastructure, such as electrical interconnection lines, thereby saving costs and further reducing environmental impact.

The project will see EGP implement a 5 MW biomass boiler that will essentially add heat to steam coming from the geothermal wells. Once completed, the 5 MW biomass plant will boost the geothermal plant's annual output by 37 GWh, avoiding the emission of an additional 17 000 tonnes of CO_2 per year, said EGP.

Cornia 2 will be supplied by approximately 130 tonnes/day of locally sourced virgin forest biomass produced within a radius of 70 km from the plant. This will be burned in a boiler supplied by Italian boiler manufacturer Sices Pensotti FCL.

The core of the biomass plant is a combustion chamber with a superheater boiler converting wet geothermal steam directly into dry steam. The combustion chamber is adiabatic, meaning there is no transfer of heat between the system and its surroundings. The geothermal steam enters the combustion chamber at 150°-160°C and a pressure of approximately 5 bar.

After exchanging heat with three heat exchangers in the chamber it exits the combustion chamber and powers the geothermal turbine at 370°-380°C while keeping a pressure of approximately 5 bar.

"Through superheating, the temperature of the geothermal steam entering the plant will be raised. This increases net capacity for power generation, thanks to both the greater enthalpy of the steam and the enhanced efficiency of the cycle due to lower humidity in the generation phase," added Deambrogio.

According to EGP the most challenging issue faced in integrating the two plants is the low steam pressure in the heat exchanger.

Deambrogio explained: "Biomass power plants use 'standard' steam boilers. In the case of the Cornia 2 plant, steam already exists and must be superheated; moreover, the steam pressure is much lower than typical values of biomass steam boilers (70-90 bar). Therefore, the boiler cannot be standard and must be specifically designed for this application, also taking into account the corrosive nature of geothermal steam."

The biomass project represents an investment of more than €15 million for EGP. Construction of the biomass plant is now under way and is due to be completed by the first half of 2015. When complete, it will operate as a baseload plant with dispatch priority.

As the output of geothermal plants typically falls over time, due to the decreasing temperature of geothermal steam with time, start-up of the biomass plant will be important in helping the facility produce clean, renewable energy for many more years. Biomass plants typically have a life of more than 20 years, which can be extended.

Operation of the new facility will also have socio-economic benefits – biomass sourcing will have a major impact on employment, with the direct and indirect creation of 35 to 40 jobs.

According to EGP, the plant represents a "major technological innovation" with virtually no impact on the environment, as it supplements an existing industrial site.

Deambrogio commented: "It maintains the total renewability of the resource and the cycle and in fact combines two renewable energy sources for a form of generation that can open new prospects for the development of energy, the economy and employment for local communities."

He concluded: "Other benefits and future prospects may result from the efficient use of agricultural and agro-industrial byproducts. Sustainable development of energy crops and the production of significant amounts of cogenerated heat will ensure the optimal preservation of forest resources. This in turn will reduce hydrological risk."

A history in geothermal energy

Italy has a long history in geothermal energy. In 1904 in Larderello in the province of Pisa, Tuscany, Prince Ginori-Conti succeeded in transforming the power of steam into electrical energy by powering five light bulbs. Later, in 1913 the world's first commercial geothermal plant began operating there with an initial capacity of 250 kW.

Since the 1950s, adjacent geothermal fields have been developed around Larderello, including Bagnore and Piancastagnaio, located at Monte Amiata, and the Travale/Radicondoli field, some 20 km east of Larderello.

Today, Italy is still one of the biggest producers of geothermal energy in the world. According to the European Geothermal Energy Council's (EGEC) geothermal market report released in December, there are now 77 power plants in Europe representing a total installed capacity of 2019 MWe. Of this total, Italy accounts for nearly 900 MWe.

The province of Pisa alone contributes more than half of the national production. The region of Tuscany is also home to geothermal agricultural and fish farming businesses.

Today, Enel Green Power (EGP) provides about 25 per cent of Tuscany's power using geothermal energy – over 5 TWh of electricity to about 2 million households. Geothermal energy enables EGP to save the equivalent of 1.1 million tonnes of oil and 3.8 million tonnes of CO_2 emissions.

EGP operates 34 geothermal power plants in Tuscany with a net capacity of 723 MW. In the province of Grosseto, the 40 MW Bagnore 4 plant is currently under construction and will be capable of generating up to 310 million kWh of electricity a year.

Moreover, EGP provides energy for heating for over 8700 domestic and business users, and around 25 hectares of greenhouses.

Although geothermal capacity will only see a small increase between now and 2018, according to EGEC, geothermal together with biomass will remain an important renewable energy resource under Italy's National Energy Strategy.

Italy's electricity production mix will see a marked increase in the proportion of renewable energy, which is foreseen up to 35-38 per cent of consumption in 2020. This will make renewables the leading source, equal to gas.

Junior Isles

A lot of talk at Lima

I once thought the origin of the word Lima perhaps had something to do with lime. Not so. Nevertheless, the final outcome of last month's UN climate change talks in the Peruvian capital left a sour aftertaste for many.

At a tent city on a military base in Lima, 194 nations agreed on the building blocks of a new global deal to combat climate change, due to be signed in Paris at the end of 2015.

At the conclusion of events, politicians were full of the customary positive spin. UK Secretary of State for Energy and Climate Change Ed Davey stated: "This is an agreement that unites all nations, unlocking the door to the world's first global climate deal in Paris next year. The talks were tough but the Lima Call for Climate Action shows a will and commitment to respond to the public demand to tackle climate change."

Yet while negotiators in typical fashion claimed the talks to be a success, it is difficult to see what progress has really been made during the last year.

The Lima talks basically agreed a work plan for countries to follow in the run-up to Paris. Under the communiqué, countries will, if possible, publish national plans for reining in greenhouse gas emissions by an informal deadline of March 31, 2015. These national plans will form the basis of a global agreement.

It sounds pretty much like what was agreed at the end of COP 19 in Poland a year earlier, where negotiators claimed that "significant new decisions" had been reached. The United Nations Framework Convention on Climate Change (UNFCC) stated at the time:

'In the context of 2015, countries decided to initiate or intensify domestic preparation for their intended national contributions towards that agreement, which will come into force from 2020. Parties ready to do this will submit clear and transparent plans well in advance of COP 21, in Paris, and by the first quarter of 2015.'

With a so-called historic agreement between the US and China just weeks before Lima, hopes were high that this time around talks would be easier. The optimism proved to be misplaced. After two weeks of talks, it still took another 30-plus hours to reach an agreement on the final text.

In fact, it took 11 days for delegates to agree just one paragraph for the final text, which said countries should "intensify their high-level engagement" to accelerate action on climate change. At one point, talks looked like collapsing after China clashed with the US and led emerging nations to reject a compromise outline of an agreement.

The clash between the two top emitters of greenhouse gases emphasised that the agreement jointly announced by US President Barack Obama and Chinese President Xi Jinping in November to combat climate change did not translate into a new, common approach.

Reacting to the outcome in Lima, Nick Molho, new executive director of the Aldersgate Group and former head of climate and energy policy at WWF-UK, said: "After a 33-hour overtime marathon to conclude negotiations, the Lima climate change talks haven't delivered as clear cut an outcome as many wished for and significant work remains to be done in 2015 if the world is to prevent dangerous levels of climate change."

Some of his former colleagues at WWF-UK were slightly more scathing. "We went from weak to weaker to weakest," Samantha Smith, leader of WWF International's Global Climate and Energy Initiative said of successive drafts at the Lima talks.

Others were also dismayed with the negotiations. Philippe Joubert, Executive Chair of the Global Electricity Initiative, said: "Personally, I was quite disappointed. After the European Council's climate agreement, the US-China accord, and with Lima being an important step on the road to Paris, I was expecting more."

Nevertheless, Joubert remains positive. "The road to Paris is still there, open. There were some positive points. The need for zero net emissions before the end of the century is clearly recognised now; the carbon price is now openly discussed; and the business community's importance as a solution provider is being recognised. It [Lima] has not injected energy into the process but it has not derailed it either."

He also added that even though the March deadline for the national targets is not legally binding, the fact that countries will publicly submit the targets makes them "morally" binding. "For me, the most important thing is that targets are being presented."

There remains, however, considerable doubt that those targets will be enough. The UN Climate Change Secretariat has already said the combined pledges by all nations likely in Paris will be too weak to achieve a goal of limiting warming to an agreed goal of 2°C above pre-industrial times.

At the close of the talks in Lima, WWF-UK issued a statement from CEO David Nussbaum.

He noted: "The destination is a deal in Paris that secures a safe and stable climate. But parts of the map to get there from Lima are missing – including the critical piece of what governments need to do over the next five years. So in the next six months, our political leaders need to spell out how they will navigate us to an agreement in Paris, which matches the scientific evidence of what needs to be done."

Achieving this in time for Paris, or even during the Paris meeting is likely to be a bridge too far. If as expected the targets are insufficient to keep within the 2°C limit, there will probably need to be another process.

Whether more COP-style negotiations are the answer, is highly questionable. As Joubert pointed out: "A big problem is that they are using the COP to set their differences and not to reach an agreement. The process is too heavy."

Certainly this has been demonstrated time after time, but at the moment there seems to be no better suggestions on how to agree on addressing this global problem.

The tough decisions may have been postponed until March but there are those who believe Lima achieved something. As Molho commented: "…they have at least kept hopes for a strong climate change deal in Paris alive and the Peruvian delegation should be given much credit for that."

Perhaps. The aim of Lima was not to reach an agreement; it was to prepare the groundwork for an agreement. In this respect, it more or less fulfilled its expectation. But make no mistake, it still leaves a tremendous amount to do in the coming 11-12 months.

It is understandable if Lima's outcome has left a slightly sour taste for many – there was a lot of talk but not much new appeared to be said.

I have now learned that the word Lima not only has nothing to do with limes but has a much more interesting and in many ways more apt origin.

Scholars speculate that it more likely originated as the Spanish pronunciation of the native name Limaq. Many centuries ago, a famous oracle in the Rímac (the valley of Lima) had come to be known by visitors as Limaq, which means 'talker'. It seems the spirit of Limaq was alive and kicking at COP 20.