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US withdrawal from Paris may have little effect on climate change

Experts say Trump's decision will see the EU and China take the lead

While many have reacted with disappointment to Donald Trump's decision to pull the US out of the Paris Climate Change Agreement, the move is unlikely to have much effect on global carbon emissions. **Junior Isles**

President Donald Trump's decision to withdraw from the Paris Agreement is unlikely to have much impact on global emissions, as efforts to combat climate change continue in the US and abroad.

In response to the decision announced at the start of June, US states accounting for more than a third of national gross domestic product pledged to meet the country's commitments for cutting greenhouse gas emissions under the Paris climate agreement.

Under a coalition called the United States Climate Alliance, California, New York, Washington and nine other states have said they are committed to cutting emissions by 26-28 per cent from 2005 levels, the reduction proposed for the US in the Paris Agreement. The coalition also pledged to meet or exceed the cuts in carbon dioxide emissions from electricity generation envisaged under the Obama administration's Clean Power Plan (CPP), which Trump has promised to scrap.

Michael Bloomberg, the former New York City mayor who is now the UN secretary-general's special envoy for cities and climate change, said that US states, cities and businesses "will aim to meet the US commitment to reduce our emissions 26 per cent below 2005 levels by 2025…even without any support from Washington". He is launching a parallel effort to co-ordinate those state, local and business commitments, called America's Pledge.

Meanwhile, the international community voiced its unwavering commitment to the Paris Agreement, with environment ministers reaffirming their strong commitment to the swift and effective implementation of the Agreement. In a communiqué issued at the end of the G7 Environment Ministers Meeting in Bologna, Italy, on June 12 they stated: "The Paris Agreement remains the global instrument for effectively and urgently tackling climate change and adapting to its effects."

Following Trump's announcement, the EU and China said they will deepen their commitment on climate change. At this year's 12th EU-China Business Summit, the two countries pledged to work together on a range of areas from clean energy and product standards to managing risk and adaptation.

Nick Mabey, Chief Executive of UK climate change think-tank E3G said: "This is the strongest bilateral

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Reports highlight pace of energy transition

Recent energy market reports from BP and Bloomberg New Energy Finance confirm that the transition to renewable energy is progressing rapidly, even as demand moves strongly towards the fast-growing developing economies of Asia.

Introducing the 2017 edition of the BP *Statistical Review of World Energy*, Bob Dudley, BP Group Chief Executive, said: "Global energy markets are in transition. The longer-term trends we can see in this data are changing the patterns of demand and the mix of supply as the world works to meet the challenge of supplying the energy it needs while also reducing carbon emissions.

In 2016 global energy demand was weak for the third consecutive year, growing by just 1 per cent, around half the average growth rate of the past decade. Once again, almost all this growth came from fast-growing developing economies, with China and India together accounting for half of all growth.

Renewables were again the fastest growing of all energy sources, rising by 12 per cent. Although providing still only 4 per cent of total primary energy, the growth in renewables represented almost a third of the total growth in energy demand in 2016. In contrast, use of coal fell steeply for a second year, down by 1.7 per cent, primarily due to falling demand from both the US and China.

Commenting on the publication, Dr Jonathan Marshall, energy analyst at the Energy and Climate Intelligence Unit (ECIU) said: "Striking in this year's data is the scale of the shift away from coal, especially in China and the USA. The US saw an astonishing 9 per cent fall in demand, while Chinese hunger for energy is being tempered by moves to a more sustainable growth pathway and the rapid expansion of renewables, which spells even further trouble for coal in the years to come.

"On a global scale, the surge in renewable generation puts it within touching distance of overtaking nuclear power as a major contributor to world energy use."

Bloomberg New Energy Finance (BNEF) revealed in its latest long-term energy forecast, *New Energy Outlook (NEO) 2017*, that renewable energy sources are set to take almost three quarters of the $10.2 trillion the world will invest in new power generating technology over the years to 2040.

The largest share of new renewable energy investments will go to solar, predicted to take $2.8 trillion with a 14-fold jump in capacity, while wind is expected to draw $3.3 trillion with a four-fold increase in capacity, according to BNEF. The report predicts wind and solar will make up 48 per cent of the world's installed capacity and 34 per cent of electricity generation by 2040, compared with just 12 per cent and 5 per cent now.

Asia Pacific will see almost as much investment in generation as the rest of the world combined, with China and India alone presenting a $4 trillion opportunity for the energy sector, and accounting for 28 per cent and 11 per cent total regional investment respectively over the 2017-40 period, BNEF predicts.

NEO 2017 shows earlier progress than forecasted towards decarbonisation of the world's power system, with global emissions projected to peak in 2026 and to be 4 per cent lower in 2040 than they were in 2016.

Although the world's power sector carbon emissions are predicted to reach a peak within a decade, the rate of decline in emissions is not nearly enough to meet the climate change targets, *NEO 2017* states. It reveals that a further $5.3 trillion investment in 3.9 TW of zero-carbon capacity will be needed place the power sector on a 2°C trajectory.

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statement on climate I have seen. President Trump has driven the EU and China together to write the rules for the clean economy."

Dingwerth: EU and China can keep Agreement in place

Ministers and leading officials at the G7 summit said the Agreement is irreversible and that its full integrity is key for the security and prosperity of the planet, societies and economies.

While the Agreement may be irreversible, the practical impacts of the US withdrawal are unclear.

Klaus Dingwerth, Professor of Global Governance at the University of St Gallen issued a research note following Trump's decision. Analysing the impact for the US it said the Paris Agreement is still based on a "tit-for-tat logic: I will cooperate if you cooperate".

Dingwerth said: "In a situation like this, the absence of Nicaragua and Syria does not matter much, but the withdrawal of one major player would normally lead you to expect that the agreement is dead. But, as far as I can see, two further options remain: One is border tax adjustment for products produced in countries that abstain from the Paris Agreement. That would be a fairly disruptive move, however, and I tend to consider it unlikely."

The statement notes that the other option is that the economic interests of China and the EU are sufficiently strong to keep the Paris Agreement (formally) in place.

"I would consider this a more likely option, but others have already commented that the pledges each signatory has to regularly make and update under the Paris Agreement will most likely become less ambitious in this scenario than they would have been in a scenario with the US as a signatory," said Dingwerth.

"Moreover, others have commented that the accuracy of monitoring, reporting and verification could also suffer from a US withdrawal, not least because this is an aspect of the agreement on which the US has strongly insisted."

Interestingly, some experts argue that President Trump's withdrawal from the Paris Agreement will have no impact on emissions reduction targets from the US power sector.

Yvonne Fuller Principal Consultant, Energy Practice at Arthur D. Little said: "The US' targets for Paris is a 26-28 per cent reduction by 2025 compared to 2005 levels. Under Obama's Clean Power Plan, the target for the power sector was 30 per cent. The Energy Information Administration modelled the CPP to deliver a 39 per cent reduction.

"Our modelling shows an 'America First' policy, without the CPP, could still deliver a 36 per cent reduction for the power sector. That's why many are saying it doesn't matter if the US pulls out of the Paris Agreement, in terms of the impact on emissions in the power sector."

Clean Energy Ministerial enters new phase

- Emerging countries take leadership on clean energy
- Advanced Power Plant Flexibility Campaign launched

Junior Isles

The eighth meeting of the Clean Energy Ministerial (CEM8) held in Beijing has seen the initiative enter a new phase, where it was agreed that the leadership will come much more from key emerging economies, particularly China.

According to the CEM, there is now a global consensus that the key to the energy transition will reside with decisions made in emerging economies. Christian Zinglersen, Head of the CEM Secretariat, said the Beijing meeting shows that "political efforts are catching up with realities on the ground".

He said: "By realities on the ground, I look at metrics such as where global aggregate energy demand is taking place now and in the next 5, 10, 15 years – it will all be in developing or emerging economies." According to the International Energy Agency, all of the projected growth in energy demand in the next 25 years will take place in emerging and developing countries.

Zinglersen added: "I also think about where the aggregate renewable capacity is taking place – China alone is accounting for about 40 per cent of that. This meeting marks the political catch-up, where the leadership of some of these work streams is being taken forward by those countries."

More concrete outcomes of last month's meeting saw new work launched around electric vehicles and power plant flexibility.

A key announcement at CEM8 was the launch of the Advanced Power Plant Flexibility Campaign. Flexibility is critical to integrate wind and solar energy into power systems and the campaign – covering all forms of dispatchable power plants, particularly coal, gas, hydro and bioenergy – aims to build strong momentum and commitment from participants to implement solutions that make power plants more flexible.

The governments of China, Denmark and Germany lead the campaign; participating countries are Brazil, Canada, India, Indonesia, Japan, Mexico, Saudi Arabia, South Africa, United Arab Emirates and the European Commission. Companies participating in the campaign include Enel, Energinet.dk, General Electric, Dong Energy and COWI; the German think-tank Agora Energiewende is also a member. The International Energy Agency (IEA) supports the implementation of the campaign as operating agent.

Commenting on the campaign, Zinglersen said: "The key challenges surround the thermal generation fleet and looking at best practice on the technology engineering side and how to increase ramp-up and down capability and the ability to operate at low load factors compared to today."

The campaign will also look at how market frameworks are evolving to incentivise thermal generators to act more flexibly.

The CEM is a partnership of 25 key countries, including most of the G20 economies, representing 90 per cent of clean energy investment and working together to accelerate the global energy transition. Its work essentially focuses on the deployment of today's technology in realising the transition.

Notably, leaders at the Beijing meeting were invited by the International Energy Agency and China to review how to increase collaboration in order to drive further deployment of carbon capture and utilisation.

China also concluded other agreements around the main meeting. On the sidelines of the CEM, the International Renewable Energy Agency (IRENA) and the State Grid Corporation of China (SGCC), the world's largest utility, formalised an agreement to enhance their co-operation. The agreement is aimed at advancing the energy transition under global and regional initiatives, including the Paris Agreement and the Belt and Road initiative.

Just ahead of the meeting China's Ministry of Science and Technology and the government of California agreed to establish the California-China Clean Technology Partnership. The partnership is designed to drive innovation and commercialisation in areas such as carbon capture and storage, clean energy, and advanced information technology that could help cut greenhouse gas emissions.

The two sides have also agreed to develop a California-China Clean Technology Partnership Fund, according to the government of California.

The agreement was announced on World Environment Day at the International Summit of New Environmental Protection Technology in Nanjing, China.

GE reshuffles at the top

- Bolze resigns from GE Power
- Power and distribution businesses to combine

GE Power will have a new CEO following Steve Bolze's decision to leave the company, after failing to secure the top job at General Electric Co. The company will also combine its power and energy distribution businesses to create its largest unit by revenue.

Bolze will step aside on July 3 for GE Energy Connections chief Russell Stokes, a 20-year GE veteran who will lead the combined business under the name GE Power.

Combining GE Power with Energy Connections, which provides power distribution and conversion equipment, will create a division with $41.9 billion in revenue, accounting for 30 per cent of its industrial revenue.

The news came just two days after the US conglomerate announced that John Flannery, chief of GE's Healthcare division, would takeover from Jeff Immelt as CEO on August 1.

Bolze, 54, said that he had told Immelt he would retire from GE if he was not chosen to lead the company.

"Some time ago, Jeff Immelt and I agreed that when the succession process was complete, and if I were not chosen, I would retire from GE and move on," Bolze said in a letter to employees. "I cannot tell you how proud and grateful I am to have been considered."

In selecting its new CEO, GE has attempted to minimise the management exodus that occurred when Immelt took over from Jack Welch 16 years ago. In naming Flannery as the next CEO, Immelt said the transition was being handled "in a different way". This time, the "much more subtle" process may not lead to as many exits, said Nicholas Heymann, an analyst with William Blair & Co.

Chief Financial Officer Jeff Bornstein, who was said to be in the running to take over from Immelt, was promoted to vice chair. GE Oil & Gas boss Lorenzo Simonelli, who analysts viewed as another potential successor, will run Baker Hughes after it merges with GE's oilfield equipment unit.

In addition to his role as CEO, Flannery will also take over as chairman from the start of next year with a mandate to improve results amid growing shareholder unrest.

Immelt led GE's move away from financial services to focus more on its core industrial units. However, the gains have been slow to materialise, partly due to the fall in oil prices that hit demand for equipment for the energy industry. GE's share price now is about 30 per cent lower than it was when Immelt took the helm in September 2001.

The company said, however, that it had begun planning for a chief executive transition this summer four years ago, suggesting that the announcement was unrelated to recent disappointing earnings.

Flannery is expected to begin a review of GE's operations but is not expected to order a complete break-up of the group. The company's new chief said GE is sticking with its strategy of using software to increase the value of industrial equipment.

The company also says it plans to sell the lighting business that is part of the Energy Connections unit, reducing revenue. It will report results for the combined GE Power unit in the third quarter.

Baltic States to decouple from Russian power grid

The European Union has announced plans for cutting off Baltic States from Russia's power grid so that the countries in the region can achieve energy independence in less than 10 years' time.

EU Climate and Energy Commissioner Miguel Arias Cañete said that Lithuania, Latvia and Estonia could link their electricity grids to the bloc through Poland by 2025.

"We have been working quite a lot to finalise a political agreement on the synchronisation of the Baltic States' electricity grids with the continental network," Cañete said, adding, "We have studied all the details to see what option was most cost-efficient and it is this that connects to the continental Europe."

Ongoing talks between the EU and the Baltic States are believed to be nearing their conclusion, and a deal was expected to be signed by the end of June to politically endorse the plan.

Cañete said if the deal is signed, the Baltic States would be ensured that they could have electricity through the grid and in full independence from Russia.

"With that MoU there will be agreed a commitment to ensure the full independence of the Baltic States in operating the electricity system through synchronisation of the Baltic States with the European network by 2025," he said.

Other options studied included a link via the Nordic countries or operation of the Baltic system as a stand-alone region.

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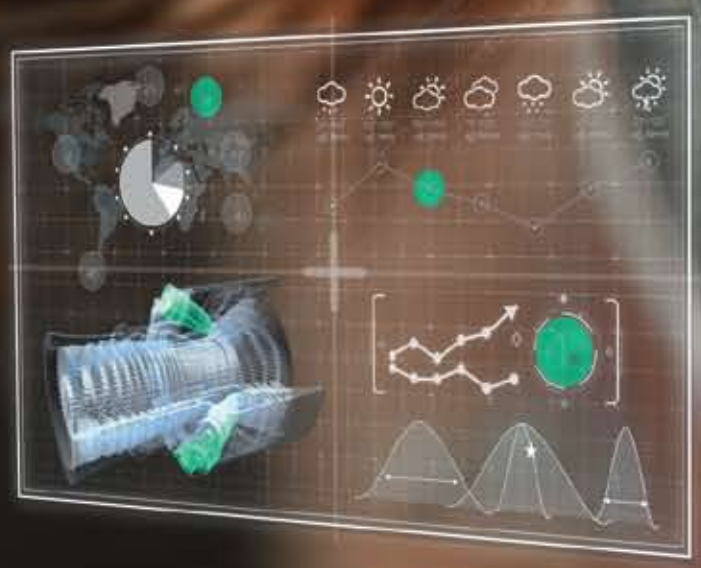

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California legislates 100 per cent renewables

Progressive US states continue to lead the way on clean energy policies in spite of Trump's attempts to underpin the fossil fuel sector.

Siân Crampsie

Lawmakers in California have approved legislation to implement one of the most ambitious renewable energy targets in the world.

The state Senate has approved, by a vote of 25-13, a bill setting a target of 100 per cent renewable energy by 2045. The legislation also includes proposals to accelerate the US state's renewables portfolio standard (RPS), and will now be considered by the state Assembly.

The move is an indication that policy makers and legislators in the country remain willing to pursue climate goals despite President Donald Trump's decision to withdraw the country from the Paris Climate Accord.

"We passed the most ambitious target in the world to expand clean energy and put Californians to work," said Senate Leader Kevin de Leon (D-Los Angeles) in a press release. "Now more than ever, it is critical that we double down on climate leadership as we learn that the President intends to withdraw from the Paris agreement. Regardless of what Washington does, California will show the way forward."

In June, the Business Network for Offshore Wind said that that Trump's decision to withdraw from the Paris Accord would not stop offshore wind farms from being built in the USA.

Liz Burdock, executive director of the Business Network for Offshore Wind, said that Trump's decision would embolden progressive states to take action on climate change, and that a formal withdrawal from the deal would take a minimum of four years.

Burdock added that 90 MW of offshore wind development in New York and that state's plans to achieve 2400 MW were "secure". Current policies will also keep the onshore wind sector growing through 2020, according to the American Wind Energy Association (AWEA).

Solar energy is also continuing to grow in the USA, with system prices on a downward trajectory.

A recent report from GTM and the Solar Energy Industries Association (SEIA) shows that ome 2044 MW of solar photovoltaic (PV) capacity was installed in January-March 2017. California was the leader in total deployments, with 507 MW for the quarter, it added.

If the bill passed in California becomes law, the state will have to entirely abandon fossil fuel electricity in less than three decades and accelerate its RPS of 50 per cent by 2030. California would also have to reach 50 per cent renewables by 2026 and 60 per cent by 2030.

E.On, Powin boost storage capacity

Energy storage facilities continue to come on line in North America as utilities seek solutions for maintaining reliable electric services.

E.On has celebrated the opening of its 10 MW Iron Horse energy storage facility near Tuscon, Arizona, while Powin Energy Corporation announced that it planned the construction of two facilities in Canada.

E.On's 10 MW lithium titanium oxide storage facility and accompanying 2 MW solar array is now helping Tucson Electric Power (TEP) to maintain reliable electric service by providing frequency regulation and voltage control support. The facility is E.On's first grid-connected lithium battery system in North America, E.On said, adding in a statement that "energy storage has the potential to truly revolutionize the 21st century grid".

"We expect energy storage systems like Iron Horse to play an increasingly important role in the delivery of safe, reliable electric service to customers as we continue our expansion of renewable resources," said Carmine Tilghman, Senior Director of Energy Supply and Renewable Energy for TEP.

Powin said in mid-June that it planned to partner with Hecate Energy to build energy storage projects at two sites in Ontario with a total capacity of 12.8 MW/52.8 MWh. The projects will be based on Powin's Stack140 modular battery system and deployed on "an extremely aggressive timeline", according to Geoffrey Brown, Powin's President.

The Ontario projects will be used for frequency regulation, voltage control, and reactive power support, and combined represent the largest rollout of energy storage in Canada. They will start operating in September 2017.

Powin Energy recently installed a 2 MW/9 MWh energy storage system in Irvine, California, for Southern California Edison.

E.On is currently building two further storage projects at its existing Pyron and Inadale wind farms in west Texas. The so-called Texas Waves projects will be based on lithium-ion battery technology and are due on line by the end of 2017.

Peru examines Rio Grande complex

The company developing the Rio Grande hydropower complex in Peru has been asked to provide more information on the project by the country's environmental authorities.

Odebrecht Energía del Perú is in the planning stages of the 750 MW project and has been asked by the Peruvian Energy and Mines Ministry to respond to 149 observations on its environmental impact statement (EIS).

The hydropower complex comprises the 600 MW Rio Grande I and 150 MW Rio Grande II plants on the Marañón river. Opponents to the project say that it threatens the area's sensitive wildlife and will also have social impacts on local indigenous people.

The EIS observations relate to project description, environmental management strategy, compensation, community and contingency plans, and citizen participation.

Chile mulls 100 per cent target

Chile will consider increasing its renewable energy target to 100 per cent, according to local reports.

The country currently has a target of increasing renewable energy sources' share of the country's power mix to 70 per cent by 2050. However, Andres Romero, Executive Secretary of the National Energy Commission (CNE), told Chile's Diaio Financiero that Chile will analyse whether the country should lift their current target to 100 per cent.

Chile is on track to reach its interim target of 20 per cent renewable energy by 2025 five years ahead of schedule, Romero said, adding that the falling costs of renewables coupled with the country's potential for solar and wind energy made more aggressive targets possible.

Non-hydro renewables account for 12 per cent of Chile's electricity generating mix, according to Bloomberg New Energy Finance (BNEF), and the country is also keen to reduce reliance on energy imports.

At the end of May, Electro Power Systems (EPS) said it had completed a new hybrid energy storage system and microgrid installation in Chile for Enel Green Power (EGP).

The EPS system is currently meeting part of the energy demand of a camp that hosts over 600 technicians working at the Enel Green Power's Cerro Pabellón geothermal plant, located in Ollagüe, in the Antofagasta region. It comprises a 125 kWp solar installation, backed by a 450 kWh hydrogen and 132 kWh lithium energy storage technologies.

The combination of technologies means that the microgrid is capable of supplying clean energy 24 hours per day, with no need for support from diesel generators. It is also able to switch from on-grid to off-grid seamlessly, EPS said.

■ Samsung C&T and Korean Southern Power (KOSPO) have completed the 517 MW Kelar gas fired combined cycle power facility in Chile's Mejillones region. The Kelar power plant will provide energy for BHP Billiton's mining operations in the region and will run on liquefied natural gas.

Brazil wind on the march

Some 12 wind farms in Brazil have won financial backing from local development bank BNDES.

The bank has approved loans totalling around BRL 1.04 billion ($303 million) to support the construction of the wind farms, which have a combined capacity of 311 MW.

The funds will also cover the construction of the respective transmission systems, BNDES added.

The wind farms are owned by EDF Energies Nouvelles, Enel and local firm Alianca, a partnership between Vale and Cemig.

Last month Brazilian energy regulator Aneel also approved four new wind plants with a combined capacity of 86 MW to start commercial or test operations. They will be allowed to start commercial operations if the test results are positive.

Earlier this year Aneel said that Brazil had added 2491 MW of new wind energy capacity in 2016, bringing its cumulative installed wind capacity to almost 11 GW.

Vietnam moves to cut dependence on coal and hydro

■ Decision 11 will support solar ■ Boost for gas fired generation

Syed Ali

Spurred by an over-reliance on coal and hydropower projects that has led to energy security concerns, Vietnam has introduced legislation to support solar power.

'Decision 11' signed by the country's Prime Minister on April 11, 2017 became effective at the start of June. The Ministry of Industry and Trade (MOIT) also issued a circular containing a draft model power purchase agreement.

Broad in its scope, Decision 11 addresses logistical issues, economic incentives, tax policy, land-use charges, and other related matters.

An incentive in the form of a feed-in-tariff (FIT) has been set at $0.0935/kWh, excluding value added tax. It applies only to on-grid solar photovoltaic projects. To be eligible, the project's solar cell efficiency must be above 16 per cent or have solar module efficiency above 15 per cent. There is no separate FIT for off-grid rooftop solar power projects, and no provision for other forms of solar technology.

Solar power projects, transmission lines, and transformers connected to the grid are exempt from land use charge and rent. The Provincial People's Committee will allocate land for investors to implement solar power projects.

While the MOIT has issued the Draft PPA for public consultation, there are a number of fundamental bankability issues that remain unaddressed. The project developer is responsible for grid connection costs and risks. However, the Draft PPA does not factor in project capacity, distance from existing transmission lines, and higher costs of installing transmission lines over longer distances.

Further revisions of the PPA are required to address bankability. The model PPA is expected to be finalised in late 2017.

Meanwhile, efforts to develop new gas fired generation are continuing at the same time.

In June PetroVietnam Power Corporation (PV Power) announced that it is preparing to implement the construction of nine gas fired power plants with total output of 5250 MW, PV Power general director Nguyễn Xuân Hòa said.

Electricity Vietnam (EVN) also announced that GE will build a 3600 MW power plant on a 132 ha site in Long Son Commune.

A liquefied natural gas (LNG) port with a capacity of 3.5 million tons per year and three blocks, each with a capacity of 1200 MW, will be built in the period from 2019 to 2025.

The news follows an earlier announcement that GE and gas giant PetroVietnam will cooperate in developing two gas fired power plants, No.1 and 2, in the central province of Quang Nam. The two plants will have a combined capacity of 1500 MW.

■ GE Renewable Energy, global wind and solar company Mainstream Renewable Power and local Vietnamese partner the Phu Cuong Group have formalised a $2 billion Joint Development Agreement to develop, build and operate the 800 MW Phu Cuong wind farm in the Soc Trang province of Vietnam.

Philippines scraps next round of FITs for solar

Philippines Energy Secretary Alfonso G. Cusi says there will be no feed-in-tariff (FIT) for the next round of solar installations in the country.

He also said subsidies will not be extended to the 360 MW of stranded solar capacity that did not receive FITs in the second wave of projects culminating in 2015. The announcement sends a clear message to the National Renewable Energy Board (NREB), which has been contemplating another form of subsidy scheme for the stranded solar developments.

Cusi said: "We want to drive electricity prices down because they are the highest in our region… continuous granting of FITs is opposed to that objective."

Some developers of renewable energy projects, however, remain undeterred by the news.

The Lopez Group recently said it is sticking to solar and wind developments even without the FIT incentives as part of its commitment toward a lower carbon energy future.

First Philippine Holdings Corp. said the group is looking to double its capacity over the next 12 months.

Meanwhile, developers are pushing for the extension of the FIT allocation for biomass and run-of-river technologies, which are set to expire by the end of the year.

Speculation over merger of Chinese energy giants

There is growing speculation that China Shenhua Energy Co, China's largest coal miner, and China Guodian Corp, one of the nation's biggest coal fired power generators are in merger talks.

Shenhua Energy Co said in a filing on June 4th to the Hong Kong Stock Exchange that it was informed by parent company Shenhua Group Corporation of a "significant matter containing substantial uncertainty, which is subject to the approval of the relevant authorities".

On the same day, Guodian Technology and Environment Group, the listed unit of China Guodian Corp, issued a similar statement, saying it was informed of the "proposed planning of a significant event".

The news comes as the government seeks to streamline state-owned enterprises (SOEs). It has merged 15 SOEs since 2015 and currently manages 103 – a number that could eventually fall to about 40, state media reported. China has vowed to further cut its industrial overcapacity to accelerate restructuring of the nation's huge SOE sector.

A merger of the energy giants would see the creation of a bigger and more competitive SOE in the global market, said Zhou Dadi, a senior researcher at the China Energy Research Society.

Wu Qi, an analyst from the commercial bank research centre at the research institute of Hengfeng Bank, said that the merger of a power generator and a coal miner is a win-win solution that takes advantage of both sides.

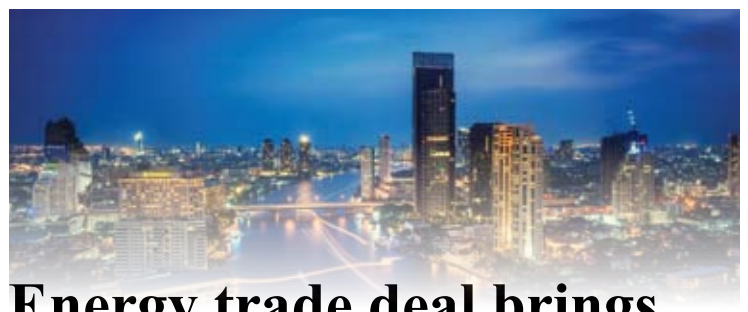
Economies participating in the Belt and Road Initiative see massive shortages in power generation and supply, and the merger will help the Chinese company better penetrate foreign markets, Wu said.

A person with direct knowledge of the matter said that Shenhua Group would take over Guodian unit GD Power Development Co Ltd.

The source, who declined to be identified, told *Reuters*: "After merging Guodian's GD Power into Shenhua, Shenhua will consider acquiring coal fired power assets from the remaining top power firms."

A second person with knowledge of the matter said merger talks were at a preliminary stage, and that the option of completely merging the two parents was likely to be tabled later.

China is also considering merging two of its nuclear power giants, as the Shanghai-listed units of China National Nuclear Corp and China Nuclear Engineering Corp Group said earlier in March that a strategic reorganisation of the companies is underway.



Energy trade deal brings Asean grid closer to reality

Thailand is preparing to sign a tripartite electricity trading agreement with Laos and Malaysia in a move that brings the long mooted Asean Power Grid concept closer to realisation.

The signing of the historic agreement is set to take place at the Asean Ministers of Energy Meeting, which will be held in Manila between 17 and 22 September.

According to Energy Ministry permanent secretary Areepong Bhoocha-Oom, Thailand has usually signed bilateral contracts in terms of electricity deals. But this planned agreement will involve Thailand and two other nations. Laos will generate and sell electricity to Malaysia under the agreement. Laos will be paid for electricity, while Thailand will receive payment for its transmission.

Areepong said: "The agreement will be for the sale and purchase of electricity between Laos and Malaysia, using Thailand's transmission system. We will be the link for the two neighbours," he said. "The volume of electricity involved is 100 megawatts." He added that in the future, Malaysia might consider selling some of the electricity it buys from Laos to Singapore.

He said he hoped that this power-grid integration by Thailand, Malaysia and Laos would encourage other Asean nations to head in the same direction.

The concept of the Asean Power Grid was first floated at an informal Asean summit in late 1997. Areepong said this upcoming agreement could make the grid a reality.

China has invested in hydroelectric dams in Laos, and Areepong says Cambodia has approached Thailand about transmission services. "This presents good opportunities for us. Electricity from Laos and Cambodia can be sold to other nations via our transmission system, if we can connect transmission lines with Cambodia too. As of now, we have already connected the lines with Laos," he said.

Offshore wind industry calls for "robust volumes"

The offshore wind industry has called on governments to set out a vision that will secure the volumes needed to further drive cost reductions in the sector.

Junior Isles

The offshore wind industry is calling on European governments to collectively ensure there is 60 GW, or at least 4 GW per year of new deployment in the decade after 2020.

Developers and manufacturers at the Offshore Wind Energy conference in London, UK, in June said delivering further cost reductions will require the deployment of significant volumes of new offshore wind. They argued, however, that most governments in Europe have still to define clear plans for how much new offshore wind they intend to deploy, notably beyond 2023.

The call came as governments of Germany, Belgium and Denmark came together with industry captains at the conference to sign a Joint Statement to further the deployment of offshore wind energy in Europe. They welcomed the cost reductions in offshore wind achieved to date and the intention of the industry that offshore wind keeps reducing its costs.

The industry has been on a steep cost reduction curve and has met its self-imposed target of €100/MWh by 2020 ahead of time. Developers and OEMs say a secure pipeline of projects is needed to drive the scale and volume for the sector's ongoing development and further cost reductions.

Samuel Leupold, CEO, DONG Energy Wind Power said: "More than ever, we need countries to coordinate and lay out a clear vision. A visible and steady pipeline of projects between 2020 and 2030 will allow for continued cost reductions, a thriving supply chain and continued European leadership in an increasingly international market for offshore wind. We welcome the joint statement and call on other governments to commit to robust volumes."

Mark Gainsborough, Executive Vice President, New Energies, Shell Gas and Power Development B.V., said the offshore wind industry should abandon the practice of awarding separate leases for offshore wind farms of up to 1 GW each and instead start developing large, integrated projects of up to 10 GW to lower cost, create value across the supply chain, and stimulate economic growth,

He said it is important for the innovations – technical, commercial and financial – to be tried and tested before going large scale, and that will not happen if the industry continues with power plant-sized leases.

Substantial cost savings could be achieved by constructing several hundred wind turbines continuously, like an offshore assembly line, which would allow the industry to learn how to do offshore wind at scale to optimise value for all participants.

Michael Hannibal, CEO Offshore, Siemens Gamesa Renewable Energy noted: "We will continue with technological innovation, testing and industrialisation to reduce costs going forward. But it's absolutely necessary to have sufficiently large volumes for offshore wind deployment."

Speaking on the sidelines of the conference Hannibal said manufacturers and developers essentially have to be sure that there are certain volumes in the market in order to make the investments needed that will keep bringing costs down.

"If we want to make the [cost] curve price points and the drivers for those points sustainable, there needs to be a pull from society. To run stable production factories, developers have to be sure that projects are coming," he said.

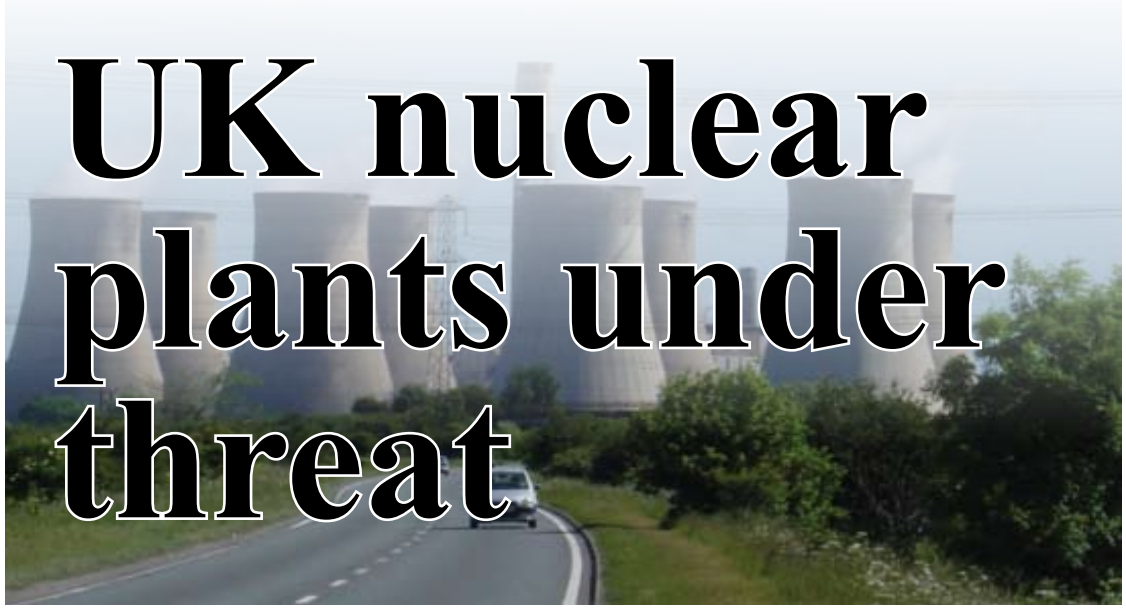
He also said that several things coming together will result in the levelised cost of energy (LCOE) from offshore wind falling to nearly half of what it is today over the next decade or so.

For current turbines, continuing evolutions will allow more energy to be produced from machines already installed. At the same time a new generation of larger machines, will further cut energy costs.

This is already under way, with MHI Vestas announcing at the start of June that its V164-9.5 MW wind turbine is now available. Hannibal said Siemens Gamesa is now working on its 10 MW "D10" platform.

The electrical grid system will also be a key area that will contribute to lowering electricity costs. Just over a year ago, Siemens introduced what it calls the Offshore Transformer Module (OTM). The first OTMs have now been sold and will be installed at projects in the UK and Germany.

Hannibal predicts the LCOE reaching below €80/MWh in 2025 and, with a sustained volume of projects, says this could fall to around €50-65/MWh between 2025 and 2030.



UK nuclear plants under threat

- Hitachi seeks Horizon partner
- Auditors slam government's Hinkley C deal

Siân Crampsie

Plans for a new fleet of nuclear power plants in the UK have been thrown further in to doubt following an announcement by Hitachi that it wants to reduce its involvement in Horizon.

Hitachi said in early June that it plans to curtail financial risk in the two projects Horizon is planning to build by seeking partners to invest in the firm.

It said that it could be forced to suspend the two ABWR projects if it cannot find investors before construction starts in 2019.

Hitachi's announcement comes amid uncertainty over the proposed Toshiba-backed NuGen nuclear plants at Moorside in Cumbria, northwest England, and concerns over the financing arrangements for EDF's Hinkley Point C plant in Somerset.

Speaking to *Reuters* at the recent Eurelectric conference in Portugal in June, SSE chief executive Alistair Phillips-Davis said that it seemed likely that only Hinkley would get built. "The bottom line in nuclear is that it looks like only Hinkley Point will get built, and Flamanville needs to go well for that to happen," Phillips-Davies told *Reuters*. He added that NuGen's Moorside project "looked tricky".

Toshiba's nuclear unit, Westinghouse, has filed for bankruptcy protection in the USA and Toshiba has announced plans to restructure its business in order to maintain its financial integrity.

Engie, Toshiba's partner in the Moorside plant has announced its intention to pull out of the project, and Toshiba has committed to buying Engie's 40 per cent stake in NuGen for €130 million. Toshiba is looking for new partners in the project.

Last month the UK's National Audit Office (NAO) published a report concluding that EDF's Hinkley C plant would lock consumers into a "risky and expensive project with uncertain strategic and economic benefits".

The NAO said that the UK's Department of Business Energy and Industrial Strategy (BEIS), which awarded Hinkley Point C a contract for difference (CFD) in 2016, did not sufficiently consider the costs and risks of the deal for consumers.

"[BEIS] has committed electricity consumers and taxpayers to a high cost and risky deal in a changing energy marketplace," said Amyas Morse, head of the National Audit Office. "Time will tell whether the deal represents value for money, but we cannot say [BEIS] has maximised the chances that it will be."

Clean energy plans pose risks for networks

Changing business models, developing technology and evolving regulation pose long-term risks to Europe's regulated electricity and gas network operators, says Moody's.

The credit ratings agency has published a new report in which it notes that decarbonisation and the continued transition to renewable energy brings both opportunities and risks, and that changes in the way network operators are regulated and remunerated will be needed if they are to maintain their credit quality.

"The shift to renewables in Europe has thrown up different challenges for the region's energy network operators, with the huge uptick in renewables-related investment into electricity networks posing execution risks, while the move to decarbonisation casts doubt over the long-term use of natural gas and the networks that distribute it," said Stefanie Voelz, Vice President and Senior Credit Officer at Moody's.

At the heart of the energy transition is a shift to distributed renewable technologies with variable output, flexible generation technologies and an increased consumer participation. While these ongoing developments could lead to sector fragmentation, potentially threatening existing network operators, their role as system operators may become more important, says Moody's.

Moody's believes that the regulatory response to the renewables shift will be key to the future evolution of the energy network sector, and that remuneration mechanisms for network operators will have to change.

However, it also notes that affordability of energy for consumers will remain a key parameter for regulators, and this may be at odds with network companies' need to invest.

CSP bids hit new low at MBR solar park

The MBR concentrated solar power project, seen as instrumental to Dubai's 2050 Clean Energy Strategy, has set a global benchmark for solar power tariffs.

The Dubai Electricity and Water Authority (DEWA) says it has received record low bids for its proposed concentrated solar power (CSP) plant at the Mohammed bin Rashid Al Maktoum solar park.

The 200 MW power plant will be the fourth phase of the MBR solar facility, the capacity of which is scheduled to reach 1000 MW by 2020 and 5000 MW by 2030. The park's third phase – comprising an 800 MW solar photovoltaic (PV) plant – has just achieved financial close.

DEWA reported in early June that it has received four bids from international consortia to build phase four of the solar park, with the lowest bid coming in at ¢9.45/kWh. In total, DEWA hopes to build 1000 MW of CSP capacity by 2030.

The current record for CSP technology is in Morocco at ¢15.67/kWh at a plant that includes seven hours of energy storage. The DEWA plant will be able to store 15 hours' worth of energy.

The level of bids shows a rapid decline in the price of CSP technology globally and analysts believe that other countries more suited to CSP than the UAE will be able to improve again on that price. It also improves the prospects of 24-hour solar power based on CSP plants equipped with storage capacity.

The UAE's high levels of humidity, haze and dust mean that it is less well suited to CSP than other countries, such as Egypt, Jordan and Morocco.

In June Masdar and EDF Energies Nouvelles said that they had completed financing for phase three of the MBR solar park.

The partners said they had signed financing agreements with seven different financial institutions from the Middle East, Europe, Asia and North America to complete the deal, the value of which has not been disclosed. Work on the solar park began in January.

"DEWA has adopted the Independent Power Producer (IPP) model to build the 800 MW third phase of the Mohammed bin Rashid Al Maktoum Solar Park," said HE Saeed Mohammed Al Tayer, MD & CEO of DEWA. "The project has also set a global benchmark in solar tariffs at a price of ¢2.99 per kilowatt-hour, a world-record-low tariff for solar power generation. The third phase will be operational by 2020."

DEWA said that the MBR solar park is "instrumental" to Dubai's 2050 Clean Energy Strategy and that it will attract investments of AED50 billion ($13.6 billion) by 2030.

The 800 MW phase three solar farm will cover an area spanning 16 km^2 and will be the largest of its kind in the world. It will also use tilting panels to track the sun to help maximise output.

EBRD backs geothermal in Turkey

Turkey is further exploiting its geothermal energy reserves thanks to a loan from the European Bank for Reconstruction and Development (EBRD).

The EBRD has mobilised €5 million from the Clean Technology Fund (CTF) for the early stage development of the Prosin-Dikili geothermal power plant near the coastal town of Dikili in the western Turkish province of İzmir.

"Under the programme, the private developer Prosin Enerji, a subsidiary of Guney Yıldızı Petroleum, has received financing to expand its exploration of the hitherto mostly unexplored Bergama-Dikili Graben and prepare the site for drilling," EBRD stated.

The company has successfully concluded surface, geological and geophysical surveys. If the drilling is successful, the EBRD is expected to support the development of an initial 10-20 MW geothermal power plant.

Turkey has set a target of having renewables account for 30 per cent of its total installed capacity by 2023, and geothermal energy will play a key role in this.

Overall the country expects to install 34 GW of hydropower, 20 GW of wind energy, 5 GW of solar energy, 1 GW of biomass and 1 GW of geothermal power by 2023.

Installed geothermal capacity has reached 850 MW in Turkey and the country has become a leading global market for geothermal developers. It has a project pipeline of around 300 MW, according to the European Geothermal Energy Council (EGEC).

Turkey's feed-in tariff (FiT) system, alongside the country's rising electricity demand and expertise in the oil and gas sector, is part of the reason for its recent success in the geothermal sector.

Russia announces wind auction results

- Fortum and Enel win
- 2.2 GW to be installed by 2022

Siân Crampsie

Over 1600 MW of wind energy capacity will be added to Russia's grid between 2018 and 2022 following the country's latest tender round.

The Russian Association of Wind Power Industry (RAWI) says that three companies – Enel, Fortum and JSC VetroOGK – will between them build 43 wind farms with a total combined output of 1651 MW following their successful bids in the international tender.

Taking into account the results of this tender and those held in 2015-2016, Russia will add 2275 MW of wind capacity to its grid, RAWI noted.

The results of the tender show that Fortum will build 26 wind farms in conjunction with its local partner, Rusnano, adding 1000 MW between 2018 and 2022. Enel Russia will build two wind farms totalling 291 MW starting in 2020, while JSC Vetro-OGK will build 15 wind farms totalling 360 MW.

Enel Russia said that it will invest €405 million in the projects, and that Siemens Gamesa would supply the wind turbines. Contracts for all of the projects will be signed by the end of September 2017.

In all, 73 applications for wind power projects with a total combined capacity of just over 2340 MW were made in the latest tender, according to data from the Administrator of the Trading System.

The 2017 tender sought to purchase 1.9 GW of capacity and started on May 29.

- GE has commissioned its first 9HA gas turbine in Russia, at a power plant in Kazan, Tatarstan republic. The new 405 MW power unit will double the output of the Kazan CHP-3 power plant and help to meet a growing demand for electricity in the region driven by industrial businesses.

Over 1600 MW of wind power will be added to Russia's grid

Renewables rise "unstoppable"

Renewable energy will remain the focus of investments for energy companies around the world, according to new data from Bloomberg New Energy Finance (BNEF).

In its latest long term forecast, BNEF says that renewable energy plants will account for 72 per cent of investments in new power generation capacity. The greening of electricity systems was now "unstoppable" thanks to rapidly declining costs for technologies such as wind and solar, as well as batteries, BNEF said.

According to the report, of the $10.2 trillion (€9.1trillion) that will be invested in new power plants by 2040 globally, $7.4 trillion will be channelled into renewables. Solar energy costs will fall by 66 per cent by 2040, while the cost of onshore wind is expected to drop by 47 per cent and of offshore wind to plunge by 71 per cent in the same period, BNEF believes.

The rise of renewables is getting a boost from batteries. According to BNEF, the lithium-ion battery market for energy storage will be worth at least $239 billion between now and 2040.

"This year's *New Energy Outlook* shows an even more dramatic low-carbon transition than we have projected in previous years, with steeper drops in wind and solar costs and faster growth for storage," said BNEF Chief Executive Jon Moore.

Meanwhile, 2016 was another record year for renewable energy installations, according to the latest REN21 Renewables Global Status Report. It also said that recent deals seen in the UAE, Mexico, Denmark, Egypt, India and Peru indicate that renewables are becoming a least-cost option.

REN21 says, however, that investment in new renewable energy installations fell by 23 per cent in 2016 compared with 2015. Among developing and emerging market countries, renewable energy investment fell 30 per cent to $116.6 billion, while that of developed countries fell 14 per cent to $125 billion. Investment continues to be heavily focused on wind and solar PV, REN21 noted.

Vattenfall aims to rival UK's 'big six'

■ iSupply will act as platform for growth ■ Restructures German hydro business

Siân Crampsie

Vattenfall is branching out into the UK's electricity and gas retail sector with the purchase of iSupplyEnergy.

The Swedish utility's acquisition follows on from a plan launched in May this year to supply electricity to UK business consumers from its wind portfolio. It will use iSupplyEnergy, a small independent supplier, as a springboard for growth in the UK retail market, which is currently dominated by six large energy companies.

"Vattenfall is in Britain to grow and the acquisition of iSupplyEnergy is in line with our strategy to grow our customer base in Northern Europe," said Magnus Hall, President and CEO of Vattenfall. "Together with iSupplyEnergy, we will be able to supply a wide range of energy solutions and services to private customers."

iSupplyEnergy has 120 000 customers in the UK's energy retail sector, which has come under a great deal of scrutiny over recent years because of concerns there is a lack of competition. Over 80 per cent of consumers purchase energy from the so-called 'big six' suppliers – British Gas, SSE, E.On, EDF, Iberdrola's Scottish Power and Innogy's Npower.

Vattenfall says it will compete with a combination of green energy supplies and digital innovations, drawing on the firm's growing number of wind farms.

"We are convinced this deal will be good for our new customers as we will combine our experience of customer focused and increasingly fossil-fuel free energy solutions with iSupplyEnergy's strong, nimble, digitalised and transparent customer service," Vattenfall Senior Vice President for Customers & Solutions, Martijn Hagens, commented.

Vattenfall has invested over £3 billion in the UK's offshore wind sector since 2008 and has recently branched out into solar power and battery storage. It has also announced plans to restructure its German hydropower business to improve profitability.

In June Vattenfall said it would cut the output of its pumped storage hydropower plants in Germany to 2500 MW, and reduce the workforce by 60 per cent. Its German assets consist of eight pumped storage projects, including the 1050 MW Markersbach and 1060 MW Goldisthal plants, with a combined capacity of 2800 MW.

Hall: supplying UK energy solutions and services

China Huayang and SkyPower team up to exploit solar market

China Huayang Economic and Trade Group Co says it will build utility-scale solar energy projects in key markets as part of China's 'Belt and Road Initiative'.

The state-owned company has signed a deal with Canada-based SkyPower making the latter its global partner in the development and construction of solar power projects.

The new partnership will combine Huayang's extensive financial capabilities with SkyPower's expertise in the solar energy sector, Huayang said, adding that it would target "key strategic markets" and "bring new, clean energy and hundreds of thousands of jobs to dozens of countries worldwide".

According to Huayang, the partnership's objective is to advance Chinese President Xi Jinping's vision of eliminating barriers in countries under the Belt and Road Initiative.

"One of the key objectives of the Belt and Road Initiative… was for Chinese companies to seek world leading organisations and build global partnerships and platforms to advance important initiatives like climate change," said Weiwen Cheng, Chief Executive Officer of Huayang International Capital Holdings, the international financial arm of the China Huayang Group. "Huayang intends to use this partnership to help promote trade and requisite financing, which will undoubtedly bring great benefits to the people and communities of these countries.

"Huayang intends to set up a multi-billion US-dollar special purpose fund to achieve this important strategic initiative for the projects of this partnership with SkyPower."

China promoted its Belt and Road Initiative to global heads of state and companies in May 2017. The initiative is a development campaign through which China hopes to boost trade and stimulate economic growth amongst its neighbours as well as further afield. It aims to exploit sea routes linking China's southern coast to east Africa and the Mediterranean ("the Road"), and overland corridors connecting China with Europe via Central Asia and the Middle East ("the Belt").

Voith and CTG enhance cooperation

Hydropower equipment supplier Voith Hydro is hoping to grow its business in Brazil after signing a deal with China Three Gorges Corporation (CTG) to further expand an existing cooperation deal.

The two companies are already working together to modernise four units at CTG's Ilha Solteira and Jupiá power stations in Brazil, and under a new agreement the companies have said they wish to extend this cooperation to other aspects of CTG's Brazilian business.

CTG bought the Ilha Solteira and Jupiá power stations – the world's sixth-largest hydropower complex – in 2014 and awarded Voith an EPC contract for modernisation in March 2017.

Commission examines GE's LM deal

The European competition authorities' attention has turned on GE's deal to buy LM Wind Power after clearing plans by EDF to purchase Areva's nuclear business.

EU anti-trust regulators cleared the €2.5 billion buyout of Areva NP by its French counterpart at the end of May, a move that clears the way for a government-backed rescue deal for the Areva Group.

EDF has agreed to purchase Areva's nuclear business as part of a wider, government-led restructuring of France's nuclear industry that includes a €5 billion capital increase for what is left of the Areva Group.

It also emerged at the end of May that EU competition regulators are re-examining a deal they approved in March 2017 in which GE purchased LM Wind Power because of concerns that GE filed misleading information.

GE had announced in October 2016 that it wanted to buy LM from private equity firm Doughty Hanson for $1.65 billion, a move designed to boost its position in the wind energy sector.

GE told regulators that it did not have any plans to develop a new giant offshore wind turbine but the EU started to suspect that it had been misled shortly after the deal was approved, according to Bloomberg news, which first reported the EU's investigation.

If the EU's regulators find that GE misled them, it could fine the firm up to one per cent of its annual sales. In their initial examination of the deal, regulators focussed on the impact of the transaction on the manufacture and supply of wind turbine blades as well as the downstream wind turbine segment.

They concluded that the transaction would have little effect on competition because GE would not be in a position to significantly affect the upstream market and other wind turbine companies would still have access to LM's manufacturing services.

Centrica moves away from large-scale generation

■ Focus remains on small, flexible generators
■ Rough storage to close

Centrica has sold the last of its large power generation assets in the UK as part of plans to refocus its business on customer-facing products and small, flexible power plants.

The UK energy group has sold its operational Langage and South Humber Bank combined cycle gas turbine power stations, with a combined capacity of 2.3 GW, to EPH UK Investments (EPHUK) for £318 million in cash.

Its Chief Executive, Iain Conn, has also told investors that the company would consider offers for its 20 per cent stake in EDF Energy Nuclear Generation.

Last month Centrica also announced plans to close the Rough gas storage facility, leading to concerns in the industry over the future security of energy supplies in the UK.

Centrica said that the EPHUK deal was "consistent with Centrica's strategy to shift investment towards its customer facing businesses and to seek opportunities in flexible peaking units, energy storage and distributed generation whilst reducing focus on large scale central power generation".

The company has already sold its interests in wind power as well as oil and gas exploration and production and has pursued opportunities in the UK to build smaller, flexible power plants.

The strategy is in response to rapid changes in electricity markets led by the growth of renewable energy and the emergence of digital technologies in the supply business.

EPH is Europe's seventh largest power generator and already owns the Eggborough and Lynemouth power stations in the UK.

Centrica's Rough gas storage facility makes up 70 per cent of all UK gas storage and is able to hold nine days' worth of UK gas demand.

Centrica said that Rough's wells and facilities are at the end of their design life and had "suffered a number of different failure modes" during a testing programme. "Centrica cannot safely return the assets and facilities to injection and storage operations," it said in a statement.

Americas

GE secures first Mexico order for HA

GE has secured its first order in Mexico for its 7HA.01 advanced gas turbine technology.

The company has signed a contract with Iberdrola for the supply of equipment for the Topolobampo III power plant, which is due to start operating in 2020 and which will have a capacity of 766 MW.

The Topolobampo III power plant will use two 7HA.01 gas turbines, a D650 steam turbine, three generators and two heat recovery steam generators (HRSGs) and the plant control system from GE's extended scope portfolio.

According to Iberdrola, the plant will support efforts to meet growing energy demand in Mexico. Electricity demand is growing at three times the rate of the OECD average in the country, and electricity consumption is expected to grow by 50 per cent in the next 25 years.

Clay contracts Omnetric

Clay Electric Cooperative has contracted Omnetric, the Siemens-Accenture joint venture, to implement a meter data management system as part of the Clay's Advanced Metering Infrastructure (AMI) deployment.

Clay Electric Cooperative is one of the largest cooperatives in the United States, serving more than 170 000 members in north central Florida. The solution, which is based on Siemens EnergyIP and is currently being deployed, will enable the co-op to improve its customer service, reliability and operational efficiency.

Omnetric's solution will provide Clay Electric Cooperative with a comprehensive meter data management system enabling it to run an improved customer billing process, one that aims to eventually include additional functionality, for example the ability to offer prepay options to members. It will also allow for future integration with Clay Electric Cooperative's outage management system.

Asia-Pacific

NGCP, First Balfour ink transmission deal

The National Grid Corporation of the Philippines (NGCP) has awarded a contract to First Balfour Inc. for the construction of the Hermosa-San Jose 500 kV transmission line project.

NGCP is undertaking a number of new backbone projects to assure the long-term adequacy and reliability of its grid in the face of rising electricity demand. The First Balfour contract for the Hermosa-San Jose 500 kV transmission line project calls for the construction of 230 steel towers over an 83 km stretch between the New Hermosa 500 kV substation in Hermosa, Bataan; and the San Jose substation in San Jose, Bulacan.

The Hermosa-San Jose project, which is targeted for completion within 18 months, aims to meet the transmission requirements of Metro Manila and Central Luzon.

Landis+Gyr, CLP deliver smart city vision

Landis+Gyr has announced that its work on CLP Power's advanced metering infrastructure (AMI) platform in Hong Kong is now operational. The AMI platform enables Hong Kong power utility CLP Power to gain timely access to electricity consumption information via smart meters. It also creates an opportunity for the utility's customers to save energy. This, in turn, enables customers to adopt smarter and greener lifestyles through the informed energy choices they are now able to make.

In addition, the platform facilitates monitoring of power supply conditions and further enhances supply reliability, safety and operational efficiency.

"Over time, this project will provide both the platform and the customer engagement tools that are key enabling technologies for the development of Hong Kong into a smarter city," said Ellie Doyle, Executive Vice President of Asia Pacific at Landis+Gyr.

Siemens supplies transformer stations

Siemens has received an order from the state-run energy provider, Bangladesh Rural Electrification Board (BREB), to supply 46 transformer substations for Bangladesh.

The €40 million order includes the design, delivery and installation as well as testing and commissioning of the substations, which have a voltage level of 33 and 11 kV. The equipment will be deployed in the states of Dhaka, Chittagong and Sylhet, and will help to increase electricity supplies to rural areas.

The scope of supply also includes the power transformers, the outdoor vacuum circuit-breakers with converters, the insulators with and without grounding switches, the converters for outdoor installation as well as 11 kV switchgear for indoor installation.

Atkins to design offshore substation

Atkins has been selected by Power-China Huadong Engineering Co. Ltd (HDEC) to design the offshore substation platform at State Power Investment Corporation's (SPIC) 300 MW Binhai South Phase 3 offshore wind farm in the Yellow Sea.

Working collaboratively with HDEC, Atkins will be part of helping China to grow a self-sustainable domestic offshore wind industry and to realise its renewable energy ambitions. It will be one of the first British companies to work on a Chinese offshore wind farm.

Andy Thompson, Atkins' market lead for offshore engineering, said: "This project is a tremendous opportunity for international collaboration that will benefit the evolution of offshore wind expertise and help ensure the industry continues to grow as a reliable source of energy. In line with our strategic ambitions to expand our offshore wind business into new areas, our first step into China working with SPIC and HDEC is an exciting one."

Goldwind signs Australia deal

Goldwind Australia has reached an in-principle agreement with state government-owned electricity retailer Aurora Energy to build a 144 MW wind park in Tasmania.

The Australian unit of Chinese wind turbine maker Xinjiang Goldwind Science & Tech Co Ltd. will build the $300 million facility at Wild Cattle Hill in the Central Highlands.

Construction work is set to start in September 2017. The scheme will increase Tasmania's wind generating capacity by almost 50 per cent.

Europe

Beleolico appoints Senvion

Beleolico Srl, a Belenergia S.A. affiliate, has appointed Senvion as the supplier of wind turbines for the Taranto wind farm, the first offshore wind farm in the Mediterranean sea.

Taranto will have a rated power of 30 MW and will feature ten Senvion 3.0M122 wind turbines, each with a hub height of 100 m. They will be installed in front of Taranto harbour in the Apulia region (Southern Italy), in a water depth of 4-18 m.

Delivery and installation of the turbines is currently planned in summer 2018, while their commissioning is expected to take place in autumn 2018.

French hat trick for Nordex

Nordex Group has been awarded three new contracts for a total capacity of 36 MW in France.

The orders, from three different project developers, involve the supply and installation of thirteen N131/3000, N117/3000 and N117/2400 turbines. Work on the wind farms is to commence this year.

Nordex will be installing its N131/3000 turbine in France for the first time. With a rotor diameter of 131 m, it will be the largest turbine installed in France to date.

Vestas wins Greece contract

Vestas has won a contract to build the largest wind farm in Greece.

Under the contract, Vestas will supply 25 units of V136-3.45 MW turbines in 3.6 MW Power Optimised Mode.

The turbines will be installed at the Kassidiaris wind park complex in the region of Epirus in northwestern Greece.

The scope of the contract includes supply and installation of the wind turbines, as well as a 20-year 'Active Output Management 4000' service agreement to optimise energy output at all times.

Vestas will start the delivery of the wind turbines in the first quarter of 2018.

Senvion and Siemens win EnBW contracts

German utility Energie Baden-Wuerttemberg (EnBW) has selected Senvion for the delivery of local wind farms totalling several hundred MW.

The two companies have signed a deal that makes Senvion EnBW's exclusive cooperation partner in upcoming auctions for wind farms in Germany. The projects will use Senvion's 3.4M140 low-speed wind turbines.

Following the 497 MW order for the EnBW Hohe See offshore wind power-plant, EnBW has also awarded Siemens Gamesa Renewable Energy with the installation of the neighbouring 112-MW-project EnBW Albatros.

EnBW Albatros is the first German offshore wind power plant that Siemens will supply as a full-scope project. Furthermore, it includes the entry of the compact Siemens OTM (Offshore Transformer Module) to the German market. The ultra-compact design of the platform not only reduces installation costs due to its low weight, but also reduces service and maintenance efforts.

Siemens Gamesa will install Hohe See and Albatros in parallel. Installation will start in spring 2018.

Overall, EnBW aims to put a total of 1000 MW of onshore wind generating capacity by 2020.

JDR selected for WindFloat

Hartlepool-based subsea cable specialist JDR has been selected by WindPlus as the preferred cable supplier for the 25 MW WindFloat Atlantic floating wind farm.

The project – located off the coast of Viana de Castelo, northern Portugal – will see the industry's first application of dynamic cables operating at 66 kV.

The scope of supply includes the design and manufacture of array cables to suit MHI Vestas V164-8.0 MW floating turbines. The wind turbines will be connected via a network of inter-array cables to a single export cable.

The WindFloat Atlantic project is located 20 km off the coast at Viana do Castelo and is planned to be operational in 2018.

International

STEG signs up MHPS

Mitsubishi Hitachi Power Systems (MHPS) has signed a contract with Société Tunisienne de l'Electricité et du Gaz (STEG) for the construction of a 450 MW gas fired combined cycle power plant in Rades, in Ben Arous Governorate, Tunisia.

The new plant will be located around 10 km from Tunis and will account for ten per cent of the country's installed generating capacity when it starts operating in 2019.

MHPS will build the new power plant on an engineering, procurement and construction (EPC) basis. Sumitomo Corporation will provide balance of plant as well as civil and installation work.

MHPS will provide a M701F gas turbine, a heat recovery steam generator and a steam turbine, and dispatch technical advisors and supervisors to support during the installation and commissioning periods. Mitsubishi Electric Corporation will provide generators.

BWSC wins Mali contract

Burmeister & Wain Scandinavian Contractor (BWSC) has won a €90 million contract to build a power plant in Kayes, Mali.

The 90 MW facility will increase generating capacity in Mali by around 25 per cent and is being developed by Redox Power Solutions. BWSC's contract covers operation and maintenance of the plant for at least 13 years.

Pöyry awarded owner's engineer contract

Gardabani TPP 2 LLC has awarded Pöyry with the owner's engineer services contract for the Gardabani II 230 MW combined cycle power plant project in Georgia.

Pöyry's assignment includes review services for Basic Engineering Design (BED), review services for detailed engineering, quality assurance plans and procedures, site supervision and project management services.

Gardabani TPP 2, a subsidiary company of JSC Georgian Oil and Gas Corporation (GOGC), has signed a turnkey engineering, procurement and construction contract with China Tianchen Engineering Corporation (TCC) for the power plant, located in Gardabani.

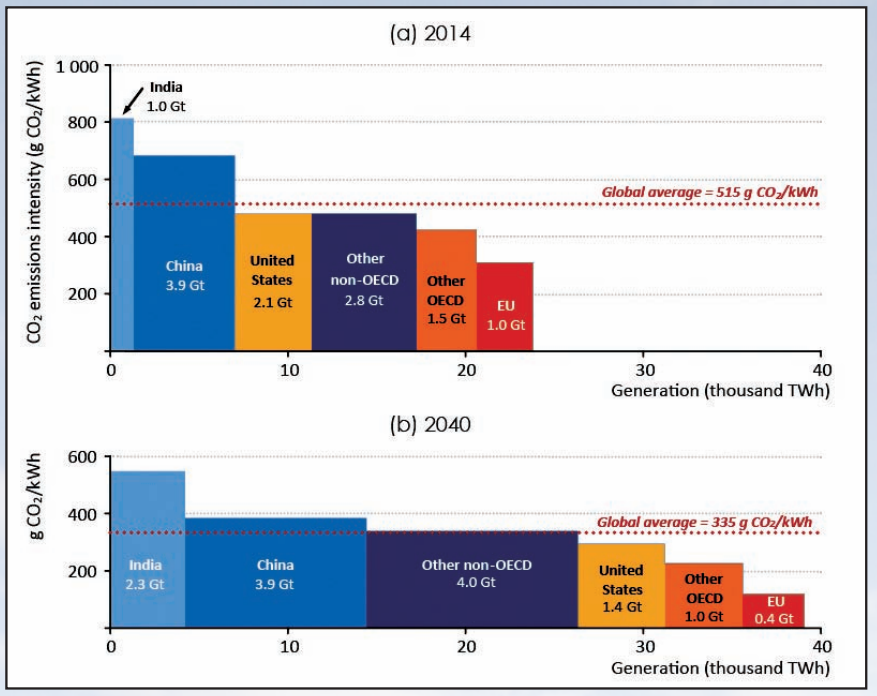
Enel Russia invests in wind farms

Enel Russia has been awarded the rights to build two wind farms in Russia with a total installed capacity of 291 MW.

The company will invest around €450 million in the projects, which will be developed and built by Enel Green Power.

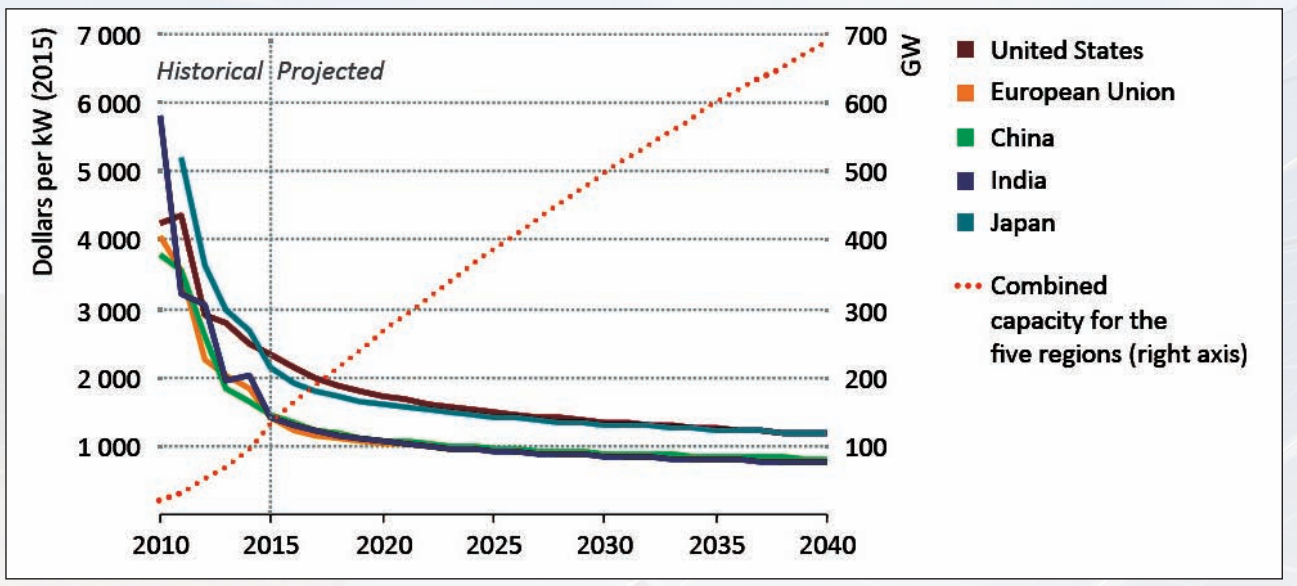
The first wind farm with the capacity of 90 MW will be built in the Rostov region and is scheduled for commissioning in 2020. The second wind farm with the installed capacity of 201 MW will be constructed in the Murmansk region and put into operation in 2021.

Carbon intensity of electricity generation by region in the New Policies Scenario



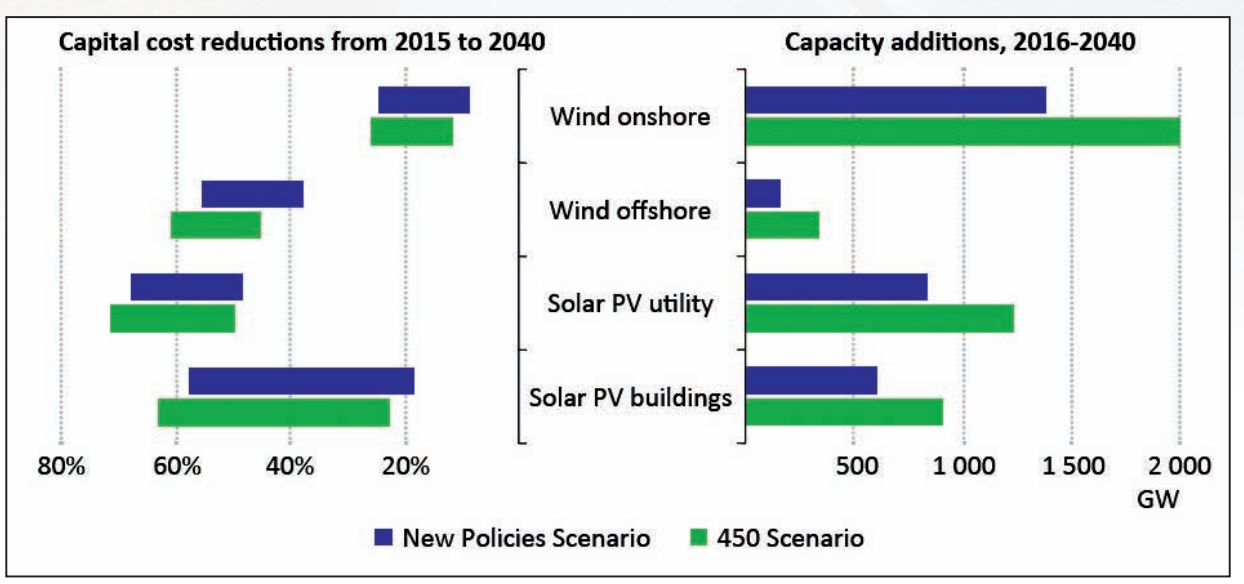
World Energy Outlook 2016, © IEA/OECD, Figure 6.14 , page 267

Historic and projected average capital costs for utility-scale solar PV in selected regions in the New Policies Scenario



World Energy Outlook 2016, © IEA/OECD, Figure 11.7, page 456

Global wind and solar PV capacity additions and capital cost reductions across regions by scenario to 2040



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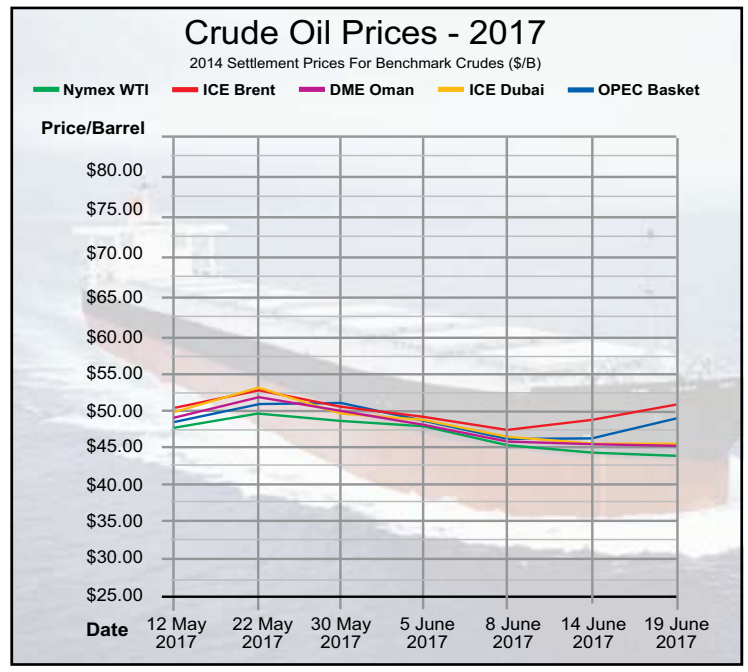
Source: World Energy Outlook 2016

Oil

Crude prices slip despite Opec efforts to trim stockpiles

- Crude could sink to $30/b
- Stocks not declining as hoped



David Gregory

It is just not going as planned. Oil prices are supposed to be going up, that's what the production cutback is all about but instead, the price of crude is falling and some market watchers are forecasting that it could hit $30/b. Despite Opec efforts to stabilise prices and bring the oil market "back into balance," the decision taken by the alliance of Opec and non-Opec producers to extend production cuts through the first quarter of 2018 has not resulted in displays of confidence amongst oil traders, who last month were declaring the situation a bear market.

The ever-optimistic Khalid al-Falih, Minister of Petroleum for Saudi Arabia, stated last month before the bear got loose that the oil market is showing signs that it is heading in the right direction.

"Market fundamentals are going in the right direction, but in light of the large surplus in stockpiles over the past years, the cut needs time to take effect," Falih told London's *Asharq al-Aswat* newspaper. "Current expectations indicate the market to rebalance in the fourth quarter of this year, taking into account an increase in shale oil production," he said, adding that oil producers are trying to influence the fluctuations in the oil market by controlling production.

The decision by former Saudi oil minister Ali al-Naimi in 2014 to boost production, drive down prices and force US shale producers to close a number of wells worked initially. But those with hard noses, the technology and the wherewithal to keep drilling discovered that they could stay in business even if oil prices were in the basement.

That was not the case with the big traditional oil producers whose economies took enormous whacks from falling oil revenues – so bad that Saudi Arabia spent about $100 billion of its foreign reserves, so serious that it forced an alliance between Riyadh and Moscow and a few other unlikely bedfellows, to pledge cuts in production and then bite the bullet.

The US oil market, however, is going all out. Output was 9.33 million b/d in mid-June and could top 10 million b/d by the end of 2018. Whether that figure is reached might be determined by the oil prices ahead. Should they fall as low as some are predicting, the US oil industry might be forced to take a breather. The closer West Texas Intermediate crude gets to $40/b, the more likely that becomes.

Complicating the market is the fact that stocks are not declining as hoped. Traders are renting old tankers for storage, planning on selling the oil for a better price in the future. Apparently, the rebalancing that the Saudi oil minister has been talking about for some months now does not appear to be happening.

Investment funds have picked up on this and have begun to step back from their investments in oil companies, especially those producing shale oil, which might serve as a signal that a new era of bust could be looming.

Another complication that could erase the Opec/non-Opec cuts, which amount to about 1.8 million b/d, is the fact that Libya and Nigeria – both of which are Opec members but exempt from the cutback because of their respective oil sectors – have experienced considerable turmoil in recent years, are beginning to increase production to a level that they consider normal.

For Nigeria that is around 2 million b/d and for Libya it is 1.6 million.

Attacks on Nigerian pipelines and other infrastructure cut Nigerian output to 1.5 million b/d. Better policing and new agreements with aggrieved inhabitants in the oil areas is causing officials to predict output will be 1.8 million b/d by the end of the year. In the past, the country has averaged production at 2.2 million b/d, but output like that now, would totally ruin the Opec/non-Opec plan.

Fighting in Libya since the revolution in 2011 has led to output falling to under 300 000 b/d. Only in the last year has Libyan oil been able to make a comeback. The National Oil Corportion (NOC) recently announced that Libya could be producing 1 million b/d by the end of this year.

The world oil market is in a perpetual state of boom and bust. The boom of $100/b plus oil is over for now, and the fog of bust is gathering with gloomy prices of $30/b.

Gas

Qatar LNG exports unaffected by diplomatic row

Despite the diplomatic crisis, Qatar is determined to maintain stability in the global liquefied natural gas market by continuing its LNG exports at normal levels.

Mark Goetz

A decision by Saudi Arabia, Bahrain, the UAE, and Egypt on June 5 to break off diplomatic relations with Qatar has yet to have any serious impact on the Gulf state's LNG exports, Qatari officials stated last month after several weeks of effort by the neighbouring states to isolate the emirate.

Saudi Arabia and other Arab states accuse Qatar of supporting terrorist groups in the Middle East. They also oppose Qatar's close relations with Iran, Saudi Arabia's regional nemesis, and its political support for groups like Palestinian Hamas and the Muslim Brotherhood, which had been in power in Egypt for two years after the 2011 revolution.

Despite the diplomatic crisis, Qatar has expressed its determination to maintain stability in the global LNG market by continuing its LNG exports at normal levels. Qatar is the largest supplier of LNG in the world. Its 80 million tons/year production last year provided the world market with 30 per cent of its LNG supply. Its gas exports have also given Qatar the highest per capita income in the world.

The advent of new suppliers to the market such as Australia, the US, Russia and East Africa caused Qatar earlier this year to lift a moratorium it had in place on new development projects in its North Field reservoir. A week before the break in relations, Qatar had announced that it would launch a new gas project that would boost its annual volume of LNG production by the end of the decade.

The diplomatic rupture immediately prompted concern amongst LNG traders, and even though the market has been facing oversupply and lower prices for several years, there was a jump in the price of LNG. Qatar's prominence in the market is such that an interruption in its deliveries would create a serious shortage.

Concerns that the diplomatic split with Egypt would affect Qatar's LNG tanker traffic through the Suez Canal prompted Qatar shipping company Nakilat to re-route two cargoes that were bound for the UK and point them on a course around the Cape of Good Hope. Meanwhile, Qatar continues to deliver LNG cargoes to Egypt, which has two floating storage and regasification units (FSRUs) anchored on its Red Sea coast.

Kuwait, Jordan and the UAE receive supplies of Qatari LNG, but it is not yet clear if LNG deliveries will continue to the UAE, where Qatari shipping has been banned. The UAE gets 30 per cent of its LNG imports from Qatar and also receives gas through the Dolphin pipeline, which also supplies Oman.

Qatar Petroleum said it had no intention of disrupting gas supplies to neighbouring countries. Even though Qatar had a legal right to declare *force majeure* and halt deliveries to the UAE through the pipeline, it would not do so, the company CEO said last month. "If we cut the gas to the UAE, it does great harm to the UAE and the people of the UAE," he said, adding that Qatar Petroleum had decided not to stop the flow. This is despite the fact that the UAE has banned ships travelling to or from Qatar from using its bunkering services at the Indian Ocean port of Fujairah.

So far there has been no official definition of the complaints that have been leveled against Doha or an outline of demands that it must meet in order for the dispute to be solved. Kuwait is making an effort to mediate between the parties but there is the possibility that the dispute could go on for some time. Until now there seems to be little chance that things could get any rougher than they are now, but the longer it goes on, the greater the chance that LNG markets could see some disruption or create tension that might have an impact on the price of oil.

While oil prices are now at an unsatisfactory low level for Gulf exporters, an interruption to the flow of crude from the Gulf could send oil prices soaring, depending on the nature of the disruption.

Down to earth utilities put their heads in the Cloud

While IT infrastructure is a growing cost centre for utilities, it is also a growing opportunity for differentiation. Using legacy IT infrastructure, however, means costs are only likely to spiral and possibilities go unrealised. Utilities are looking at cloud computing as a genuine technological gearshift. **Harry Nota**

There was a time when the technical challenges faced by utilities were predominantly engineering ones – how to transmit power, regulate voltage or produce the stuff in the first place. Some engineers probably look back wistfully for what seems, in hindsight, like a simpler time.

Now the biggest hurdles are digital, and the difficulties in managing voltage have given way to those around managing data. The nascent smart grid has data at its heart, but other changes such as renewable energy, an increasingly unified European energy market and changing customer demands all add to the weight of IT burden faced by a modern utility.

But while IT infrastructure is a growing cost centre for utilities it is also a growing opportunity for differentiation. Using legacy IT infrastructure, however, means costs are only likely to spiral and possibilities go unrealised. That's why utilities are looking at cloud computing as a genuine technological gear-shift.

Microsoft defines cloud computing as 'the delivery of computing services – servers, storage, databases, networking, software, analytics and more – over the Internet ("the Cloud").' This removes the need to install and host such services on your own IT infrastructure, liberating companies to spend less on their IT estate, or free up resources for other uses.

For utilities, it's also an answer to the perennial issue of running various different IT systems of various ages and levels of sophistication across the business. Some of these may be the latest and greatest, others 20 years old with lengthy and fiddly workarounds needed to get the right data flowing between them. Cloud removes that issue; companies will always have access to the most up-to-date versions of systems. And they won't need to retain their own large IT teams to maintain in-house systems.

This is important for updating existing systems and becomes crucial when considering how many new ones utilities are likely to need in the next few years.

But there's more to the story than general tech improvements. Why specifically, are utilities so well placed to benefit from the Cloud?

In terms of existing systems, two of the biggest areas utilities stand to gain in are ETRM (Energy trading, transaction and risk management) and treasury systems.

Trading and risk management has always been a tricky area for utilities, especially those with generation and retail arms. On the one hand, there are inbound trades featuring any input commodities used for power generation. A single large utility might have to buy-in coal, natural gas and potentially oil, no doubt from a variety of suppliers and geographies with a range of different contract options, prices and timescales. On the other, there are a variety of already bought and sold forward contracts to hedge positions and meet contractual obligations. This might be managed across a number of different systems across different desks which may or may not talk to each other. That makes it quite the task for a head of trading or risk to keep abreast of all their exposures across the business.

This only becomes more complicated as renewables push utilities towards the intraday market, greatly increasing the number of transactions to keep an eye on.

Then pity the poor treasurer, who has to keep an eye on all of these contracts while also assessing additional business risks such as credit and foreign exchange. Think that the large Angolan LNG shipment is all covered from a risk perspective? Well, what if there's a large shift in the value of the Angolan kwanza? Suddenly prices change considerably and the risk with it.

Again, it's a story of disparate data sources, complex IT systems and the challenge of maintaining them.

But, important as those data burdens are, they arguably pale into insignificance compared to what's on the horizon.

First, let's look at the obvious: the smart grid revolution. Smart meters are the start of an industry and society-wide shift to data-centric systems that look to maximise efficiency and value based on the insights that only swathes of information can give. In the future, smart technology will crowd out the dumb in every sphere, but for now just look at smart meters.

The European Commission expects around 200 million smart electricity meters to be installed in Europe by 2020 (and around 45 million for gas). If they provide customer data every 30 minutes (though they're technically capable of much more), that's up to 9,600,000,000 electricity data readings per day.

That data needs storing somewhere, and it needs to feed seamlessly into analytics engines designed to more responsively match supply and demand. That data also forms the basis of a raft of new services expected to characterise next generation utility offerings. For example, if a utility can break down customer data to a granular level, they may be able to offer more appropriate time-of-use tariffs, or energy saving services. Many are already partnering with smart home providers to offer customers a more holistic homecare package.

The data must also be balanced against generation data, weather data (to forecast near-term renewable yields) and system data in order for utilities to dynamically plan which assets should be used to fulfil their supply obligations. Do the renewable assets in the portfolio cover current supply obligations, or do they need to ramp up a combined cycle gas turbine (CCGT) plant? Should they call on DSR aggregators, or are high winds pushing intraday spot prices low enough that it's cheaper to just buy to cover any shortfall?

To be clear, these are good problems to have. They enable utilities to become more efficient entities and higher value service providers for customers but they create IT headaches all the same.

There are two main concerns when it comes to the Cloud, which have until recently held it back from delivering its potential value.

First, as with anything new, there is a cost. Cloud technology is not particularly expensive upfront, but for utilities that have invested millions into IT estates and legacy systems there's an understandable reluctance to go a different route and start again from scratch.

However it's entirely possible to start with some services in the Cloud while continuing to run others in-house. Then, piecemeal shifts can happen in future when it would come time to upgrade them anyway. Existing investments are protected as there's not necessarily a need to rip and replace.

Perhaps the biggest worry for the Cloud though, is security. It's easy to see why the idea might make the CIO uneasy. By accessing services via the Cloud, you become dependent on another organisation – if they are compromised, so are you. That's uncomfortable. To make use of the services you also need to send swathes of your sensitive customer and operational data to this external, shared network – what happens if it's intercepted? It feels much safer to keep things within your own four walls.

However, in reality the major Cloud service providers are some of the biggest tech companies in the world. The resources and talent poured into Cloud security by a company such as Microsoft Azure will likely be costed in the billions, dwarfing the cyber security budgets of even the biggest utilities.

In all likelihood, utilities and their customers are probably safer when working with the Cloud than on their own. After all, it's true that hiding your money under the mattress avoids certain risks, but most would agree it's safer in the bank.

For a modern utility trying to keep up with the pace of change (and potential agile new competitors), it's nigh on impossible if relying on an extensive, ageing in-house IT estate that's costly to maintain and extortionately expensive to expand for the sake of new data storage and services.

Instead, utilities can look to the Cloud to liberate them from trying to be tech companies, allowing them to maintain focus on their core mission: to deliver ever better power and gas services to their customers profitably while Europe's grids become ever more international, smart and data-intensive.

Harry Nota is Head of Energy, EMEA, OpenLink

Nota: as important as data burdens are, they arguably pale into insignificance compared to what's on the horizon

Carbon neutrality by 2060?

The International Energy Agency's recently published *Energy Technology Perspectives* reveals that only four out of 26 assessed technologies remain on track to meet climate objectives, and says that stronger policy actions will be needed to drive technological development. **Junior Isles** reports.

The international energy community has a mountain to climb if it is to meet the climate change ambitions set out in the Paris climate change Agreement. The International Energy Agency's *Energy Technology Perspectives* (ETP) 2017 highlights the extent of the task.

First published in 2006, the ETP looks at the impact of energy technology today and in the future, and the energy and emission trajectory through to the mid-century. While the report finds that progress is being made in the transition to a low carbon energy world, there is a growing likelihood that the Paris climate targets will not be met without more decisive policy actions and market signals.

Launching the report, Kamel Ben Naceur, IEA Director of Sustainability, Technology and Outlooks said the energy sector was changing at a speed "not seen in the last decade".

Last year, renewables met half the global electricity demand growth and nuclear capacity reached its highest level since 1993. Meanwhile global energy intensity improved 2.1 per cent in 2016. These combined trends have resulted in global CO_2 emissions remaining flat for the last three years, stabilising at around 32 Gt/year. At the same time, the global GDP has been increased, indicating a decoupling of economic growth from carbon emissions.

ETP 2017 presents three pathways for energy sector development to 2060: the Reference Technology Scenario (RTS); the 2°C Scenario (2DS) and the Beyond 2°C Scenario (B2DS).

The RTS reflects the world's current ambitions. It provides a baseline scenario that takes into account existing energy- and climate-related commitments by country, including Nationally Determined Contributions pledged under the Paris Agreement. While the RTS represents a significant shift from a historical "business as usual" approach, the IEA says it does not achieve the global climate mitigation objectives.

On this trajectory, however, CO_2 emissions increase to about 40 Gt/y. More ambitious decarbonisation requires increased effort and sustained political commitment. The 2DS and the B2DS each therefore sets out a rapid decarbonisation pathway in line with international policy goals.

The 2DS has been the main climate scenario in the ETP series for many years, and it has been widely used by policy makers and business stakeholders to assess their climate strategies. In this scenario, says the IEA, emissions fall to 10 Gt/y in 2060. This would lead to a global temperature rise of 2.7°C by the end of the century

For the first time, the IEA has therefore proposed the B2DS which looks at how far known clean energy technologies could go if pushed to their practical limits, in line with countries' more ambitious aspirations under the Paris Agreement.

In the B2DS, the energy sector reaches carbon neutrality by 2060 to limit future temperature increases to 1.75°C by 2100 – the midpoint of the Paris Agreement's ambition range. This pathway implies that all available policy levers are activated throughout the outlook period in every sector worldwide. This would require unprecedented policy action as well as effort and engagement from all stakeholders.

In terms of technology, Naceur identified the main technologies that will deliver the predicted carbon reductions. He said that in the B2DS, efficiency is seen as the biggest contributor to cutting carbon, accounting for 34 per cent of the reduction. This is followed by carbon capture and storage (CCS) at 32 per cent, fuel switching at 18 per cent renewables at and nuclear at 1 per cent.

The important question, however, is where we are now compared to what is needed. Every year, the IEA publishes a report called '*Tracking Clean Energy Progress*'. Commenting on its findings Naceur said: "What we see is that we have technologies that are not on track if we want to be in line with the 2DS."

Out of the 26 clean energy technologies – which in addition to power generating technologies also includes things like transport biofuels, building construction and lighting – only four were on track. These are solar PV, onshore wind, energy storage and electric vehicles.

"We need to make significant progress. Fifteen technologies are showing some level of progress but not enough and eight are significantly off track and need significant focus going forward," stressed Naceur.

Looking at the power sector, he noted that a number of sub-critical coal fired units are still being commissioned, although much more efficient ultra-supercritical plants are widely available. Notably, CCS is way off track.

Naceur said: "We are very far from the commitments that were made about a decade ago of having a number of large scale plants. Today we are storing about 30 million tons from the 17 large-scale projects around the world. We must not think of 20-40 million tons but must multiply those numbers by a factor of 100. This is the scale needed to be in line with the 2DS and B2DS ambition."

In the 2DS, ETP 2017 says the world should capture and store 1 Gt of CO_2 today, and 6500 Gt by 2060.

"We have quite a big challenge ahead of us," said Naceur.

The IEA noted, however, that there is "significant potential" to reduce the cost of capture and added that there are certain industries that cannot be decarbonised without CCS. This, it says, could drive further investment in the technology.

According to ETP 2017 approximately 660 GW of low carbon capacity has to be deployed each year between 2030 and 2060. And despite the staggering success in solar PV and onshore wind, more has to be done. The IEA projects that solar PV and onshore wind electricity generation will grow by 2.5 times and by 1.7 times, respectively, over 2015-20. But even though renewable power additions keep breaking records, they need to grow much faster to reach the 2DS electricity generation targets.

Such a transition will call for a complete transformation, where the traditional one-directional energy delivery system is replaced by a digitally enhanced, multi-directional, integrated smart energy system.

ETP 2017 highlights the importance of storage in this future energy system. While near-term storage needs will largely be met by existing or planned pumped hydro capacity, non-pumped hydro (non-PHS) will play a significant role by 2025. The report predicts a 50 per cent year-on-year growth that will see it reach about 20 GW. This represents about 10 per cent of the energy storage market by 2025.

This rapid rise will be spurred by falling costs. In 2000, the cost of battery storage was $1000 kWh but fell to $300/kWh by 2015. In its 2DS, the report projects a cost curve that will see this hit the $100/kWh mark by around 2050. The B2D shows a similar cost curve but is accelerated by about 15 years.

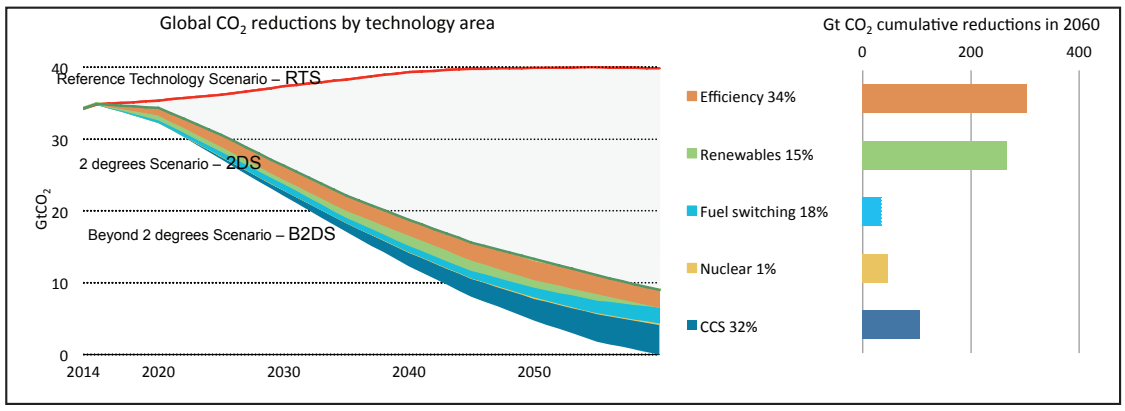
Advances in areas like energy storage are crucial for the integrated systems approach that is needed to accelerate the transformation of the energy landscape. The IEA notes that each country should define its own transition path and scale-up its RD&D support accordingly.

According to the ETP 2017, annual RD&D investment by the public and private sector was nearly $30 billion in 2012. With the announcement of Mission Innovation – an initiative launched in 2015, aimed at doubling clean energy investment – ETP 2017 projects this figure to reach $40 billion in 2021.

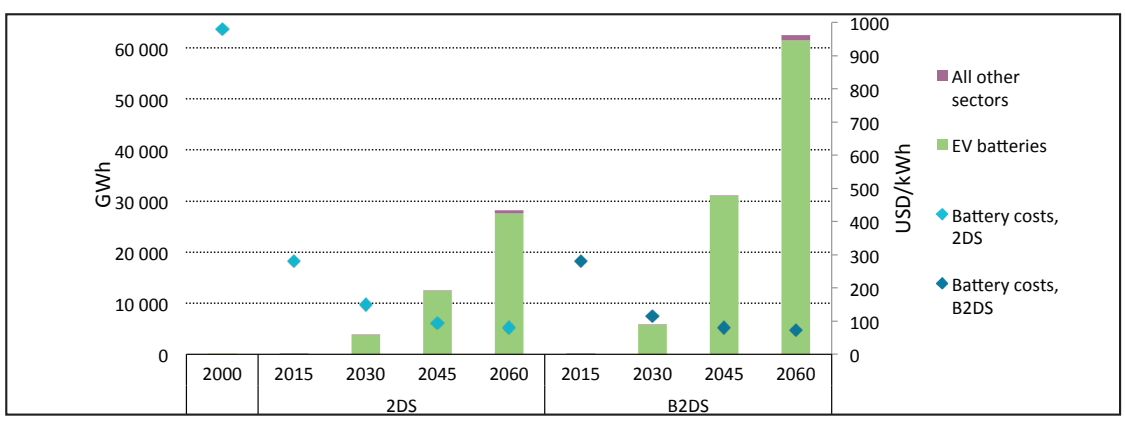
While the objective of Mission Innovation should be applauded, Naceur says RD&D investment in clean energy pales in comparison to the IT sector. "The top three companies in the IT sector alone will spend more than we are projecting in 2021," he said.

The IEA concludes that technologies and policies are helping the transition and altering the emission trajectories, but progress is too low.

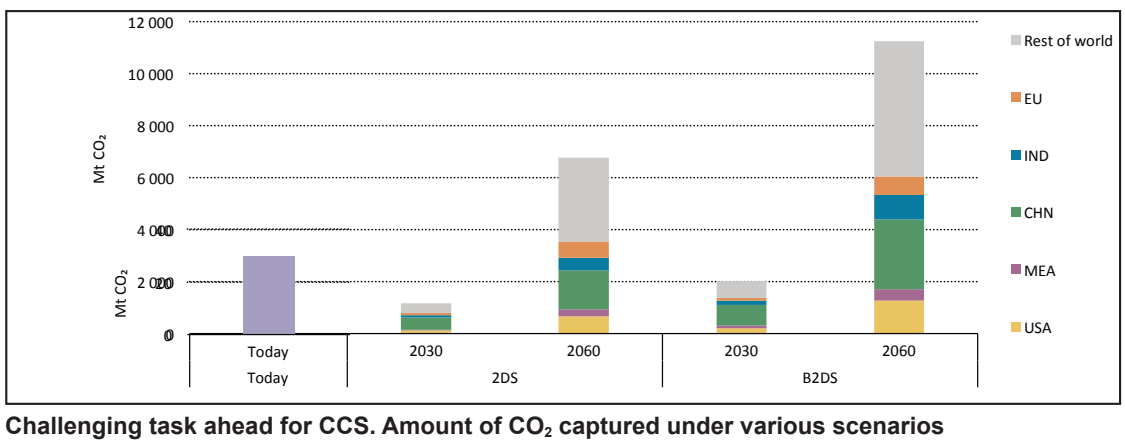
Naceur summed up: "Achieving carbon neutrality by 2060, and this is the first time the IEA has shown this, requires unprecedented policies and investments. Innovation can deliver, but policies must consider the full technology cycle, and collaboration is extremely important to provide synergies and avoid duplication."



How far can technology take us? Technology area contribution to global cumulative CO_2 reductions



Batteries experience a huge scale-up in the B2DS, with EV batteries leading other sectors in size



Challenging task ahead for CCS. Amount of CO_2 captured under various scenarios

Block by block

Blockchain is the new buzzword in the energy sector and there are many industry players examining how they might gain an advantage with this new technology. **Siân Crampsie**

In May 2017, a group of ten global energy companies pledged a total of $2.5 million to the Energy Web Foundation (EWF), a new organisation devoted to accelerating the use of blockchain technology in the energy sector.

The announcement by EWF, an alliance of the Rocky Mountain Institute and Austrian blockchain developer Grid Singularity, is an indication that the energy sector's incumbents are finally paying attention to blockchain – a technology that could speed up the pace of the energy transition and further disrupt an industry already faced with huge challenges and uncertainties.

"The main challenge of the electricity sector in the 21st Century is to integrate more renewable energy into the grid in a cost effective manner," said EWF President Hervé Touati, speaking in May. "We are excited by the potential of blockchain technology as an enabler to realise that vision."

Blockchain technology offers all businesses the prospect of low-cost, efficient, relaible and secure peer-to-peer transactions. In the energy sector, obvious applications of blockchain include energy trading, green certificate trading and contract management.

However business models in the energy sector are changing because of the energy transition and other disruptive forces such as the Internet of Things (IoT), and blockchain could play a key role. "We think that blockchain could provide solutions to some of these challenges," said Frost & Sullivan Industry Analyst Vijay Michalik, "especially around data coordination, trading platforms, and a new way to enable open access to innovative products and services."

A number of startups are already active in the application of blockchains in the energy sector, including Grid Singularity, which is developing a decentralised energy data exchange platform to facilitate smart grid management, green certificate trading and energy trading, and Australia-based Power Ledger, which is creating an energy trading platform for prosumers.

The energy sector's big players are now getting involved, too. Aside from the backing of EWF by the likes of Centrica, Elia, Engie, Sempra, Shell, SP Group and Statoil, Siemens and LO3 Energy earlier this year joined forces to develop microgrids in which energy users and producers can directly trade energy.

Elsewhere, RWE's Innogy has embarked on a joint venture with Slock.it to create Share & Charge, a business which is aiming to help overcome the challenge of building up charging infrastructure in the electric vehicle (EV) sector.

"Share & Charge provides new channels for owners of charging stations to monetise their charging stations by being part of a new economic sharing economy network of charging stations," said Michalik. "This is enabled through a blockchain app that gives users a digital wallet that connects with EV charging stations, and allows owners to set tariffs."

The crossroads between the energy transition and digitalisation is creating the perfect opportunity for energy companies to learn more about how blockchain can help them transform their business, says TenneT's Rene Kerkmeester.

"We are going from a very predictable system based on coal and gas, to a much more weather based system based on solar and wind, and also the behaviours of our consumers are changing rapidly," said Kerkmeester. "This is very important for us at TenneT as we are a transmission system operator and we are responsible for balancing the system."

To meet the challenge of greater volatility in the electricity system, TenneT has realised that it needs to tap into the potential of distributed, flexible energy sources, including solar panels and batteries owned and operated by households and small businesses. It has launched two pilot projects in Europe to demonstrate and test ways in which blockchain can help it to connect with consumers.

"If we had wanted to connect these people in the past, it would not have been easy to do at low cost. But with blockchain, the set up costs and transaction costs are very low," adds Kerkmeester.

As part of a broader digital transformation programme, TenneT is testing the use of a permissioned blockchain network that uses Hyperledger Fabric to integrate flexible capacity supplied by electric cars and household batteries into the electrical grid.

EV charging: TenneT has teamed up with Vandebron to use the capacity available in EV batteries to help it balance the grid

In the Netherlands, TenneT has teamed up with Vandebron to use the capacity available in EV batteries to help it balance the grid. The blockchain enables each car to participate by recording its availability and its action in response to signals from TenneT.

"We are able to view baseline information on [the batteries], put in price levels, and once activated, we can see immutable and indisputable data," said Kerkmeester. "And we can settle the whole process on the blockchain. It's very scalable and has very low transaction costs."

In Germany, TenneT is implementing a pilot project with sonnen eServices to help ease congestion management on the grid. "Sometimes in Germany we don't have enough capacity to transport energy from the north to the south, and we have to curtail wind farms generating energy in the north," said Kerkmeester.

TenneT and sonnen are therefore using residential solar batteries to store excess energy; when the grid is congested, batteries in the south are depleted while those in the north are charged.

The blockchain presents TenneT with a view of the available pool of flexibility, ready to activate at the push of a button, and will also record the batteries' contribution. This pilot will enable TenneT to avoid congestion charges, which can be very high in Germany, and will also support the integration of renewable energy sources into the German electricity supply system.

In both pilot projects, sonnen and Vandebron serve as aggregators that enable TenneT to interact with large groups of electricity consumers via their existing communications channels. Each project currently involves around two hundred batteries, says TenneT.

"The volume at present is negligible," notes Kerkmeester. "We want to prove that the concept works, and then scale up. We can do this by finding additional partners who can serve as aggregators."

Initially the projects will run for a couple of months, starting later this year. In Holland the project will be fully embedded in TenneT's core systems, enabling the firm to scale up easily when it needs to. "Ideally these are not so much pilot projects, but first implementation," said Kerkmeester. "If things work out we will ask other aggregators to join. We will make that decision at the beginning of 2018."

If the projects are successful in demonstrating the business benefits of blockchains, Kerkmeester can see how the technology could be rolled out in other parts of the electricity sector. "Potentially these could be very disruptive," Kerkmeester said. "The blockchain will be integrated in our core systems and given the fact that they are so efficient, you may as well use them to connect other sources of power, including the large power plants.

"There is a lot of potential to scale up."

What are blockchains?

Blockchain is the technology underpinning the digital currency, Bitcoin, enabling transactions involving the cryptocurrency to be recorded, traced and made publicly available. But since the release of Bitcoins in 2009, developers have come to realise the potential for the use of blockchain in other industries.

Blockchains essentially create a digital ledger that record and continually reconcile transactions – and other types of information – across a distributed network. These records are available to – and can be updated by – anyone with access to that network. Blockchains therefore eliminate the need for central oversight of a ledger, and enable information flows to be managed quickly and efficiently.

Crucially, blockchain enables ledgers to be shared transparently and are immutable, i.e. they cannot be altered, and they therefore build trust between partners in a transaction. Anything of value to a business – tangible or intangible – can be tracked and traded securely, without the need for third parties.

Blockchain therefore shows great promise across a wide range of industries, and have been described as having the potential to be a gamechanger for many. Around $1 billion has been invested in the development of the technology so far, according to Frost & Sullivan. "Interest in Bitcoins peaked in 2014, but blockchains are just getting started," said Frost & Sullivan Industry Analyst Vijay Michalik.

The finance sector has seen most disruption – largely because of the emergence of Bitcoins – and banks are now actively exploring the ways in which blockchain can help them to speed up and reduce the costs of transactions. In the manufacturing sector, organisations are seeing how blockchains can help track the origin and movement of supplies and products.

Dancing to a new tune

Junior Isles

The European electricity sector seems to be at a turning point. Having had to deal with issues such as low power prices, policy uncertainty, the rise of renewables and subsequent write-offs of generating assets, to poor public image mainly due to high levels of mistrust, Europe's utilities now seem ready to embrace a new energy future.

As portfolios stabilise and severe cost reduction measures take effect, Europe's energy companies finally see the rapidly changing energy landscape as more of an opportunity than a threat. This was certainly the general sentiment at Eurelectric's Annual Convention in Estoril, Portugal.

Speaking on the sidelines of the conference, Serge Colle, Partner, EY, said: "A lot of utilities now really have embraced the energy revolution and I'm starting to see that a lot of the thinking as they strategize, is that they are stretching their thinking beyond today's uncertainty. They are projecting themselves in [to] a world where there is no debate about whether there will be more batteries or electric vehicles, or whatever, but are proactively sorting out what their purpose will be in that space."

Indeed the discussion around the future role of utilities was a central theme of the conference.

Over the last year or so there has been a noticeable rise in the importance of distribution companies (discos) with regards to their role in an electricity market that will be largely based on renewables in a much more distributed system where consumers are an active part of the market.

With the network set to play a key role in implementing the new energy economy, there has been a lot of discussion of what EY calls the "new fields of play". Paul Micaleff, Director, Global Power & Utilities – Advisory Service, EY, explained: "There are a lot of conversations around things like electric vehicle infrastructure and the network as a platform and all of these themes pose an interesting question: who is best placed to engage the consumer? Is it the network company, the retailer or a combination of both? And will we see a fight for survival between them?"

While it could be argued that the market is currently set up for retailers to lead the debate and take the lion's share of the money to be made, the possibilities for discos cannot be under-played.

Discos own the networks and have a key mandate to ensure network stability. This, says Colle, gives them a very strong argument. "It means they can run applications for the sake of network stability just as well as someone else who thinks they can make money on the same basis."

There are undeniably significant opportunities for discos in the new energy world. Francesco Starace, CEO of Enel and incoming President of Eurelectric said: "Today the distribution sector has the potential to become an incredible, very hot area of technology improvement in transformation for the benefit of the whole system. Distribution has always been at the back of any energy debate in the past. It's time to put it at the front because that's where most of the action will happen in the coming years… so Eurelectric will try to put a lot more attention to the DSO part of the sector."

Accenture launched a report at the conference entitled '*Power Play: New Platform Models of Power Distribution in the Future Energy system*'. The report is set against a background of an increasingly distributed energy system, where DSOs are seen as "Distribution Platform Optimizers" that perform distinct roles in new ways.

Commenting on their role versus that of the retailer, Sander van Ginkel, Managing Director Accenture Strategy Utilities said: "Everyone understands what needs to be done but the controversy is who does what? There are three things the DSOs need to do but in a different way. The first two are asset management and active systems management. The controversy surrounds the third role – neutral market facilitation."

He explained that it is critical that there are platforms to connect "devices" such as solar, wind, storage, electric vehicles and demand response solutions, etc. These each have an IP address so they can be seen and controlled via the platform. The platforms can also be used for carrying services, e.g., an app for energy control in a home, or charging EVs. Certainly, the growth in value creation from platforms as a result of increasing electrification presents a real opportunity for the discos.

"I think the DSO can play a good role in these platforms because these platforms need to be neutral," said van Ginkel. "It is better that the entity that operates the platform is not actively participating in the market themselves. They are the referee but not the player on the soccer field. So we argue that the neutrality of the guy that operates the platform and facilitates the market is critically important. He can do this by making sure the platform is open to all service providers. Naturally, there is controversy, since the platform is an excellent instrument to gain direct control and get into a monopoly position."

Knud Pedersen, VP Dong Energy, echoed this thinking, saying that the DSO "has a huge role" to play. "The platform should be available to serve and connect customers, which we don't even yet know about today. The DSO thinking therefore has to be developed in a way to create value for all these needs… In my mind the retailer is a customer of the DSO; so we will have to provide them with the right service so that they can deliver a full package of services to their customers."

Acknowledging the changing times, utilities are now putting the customer at the heart of their new strategies. In his opening keynote speech at the conference António Mexia, outgoing President of Eurelectric and CEO of Energias de Portugal (EDP), listed empowering customers as one of three key things at the heart Eurelectric's focus.

"The customer, today, is at the centre of the circle; and recognising this is mandatory. Empowering customers is not saying anything new but we need to walk the talk and be consistent with this new reality. We need to put the customer at the centre of the debate; customers want affordable, sustainable and secure supply of electricity as well as innovative services… They want to become active actors in the energy transition."

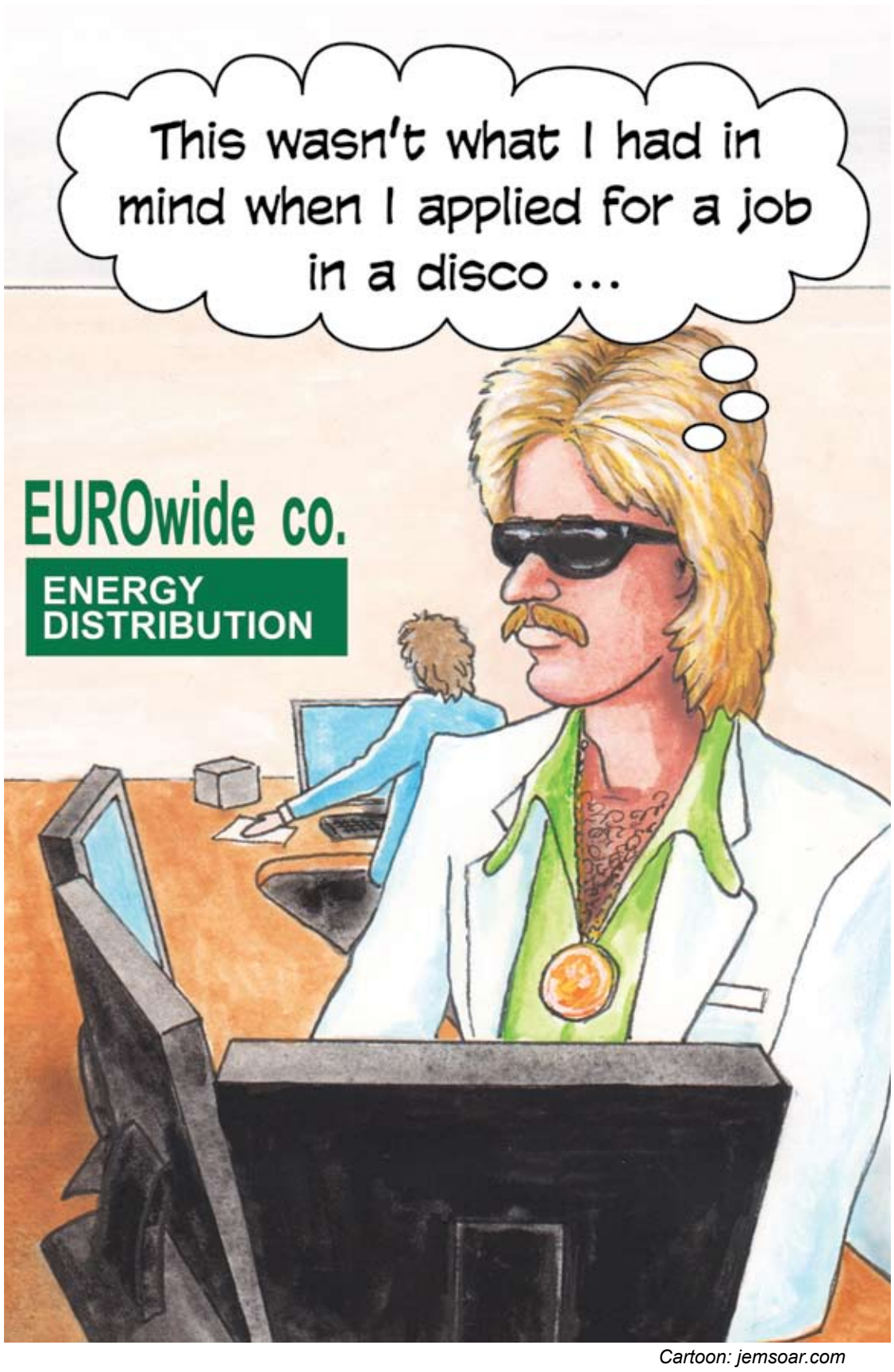
While Starace noted the importance of customers – whether they are individuals, businesses or industrial entities – he pointed out that energy companies must carefully manage their transformation.

He said the transition can be a cost if not properly managed. "We can continue to extract value from assets… We should not just throw away things because they belong to a certain technology that we think is at the end. It might be at the end but it could be a longer end than you think."

Giving examples, Starace said. "If you look at the distribution grid, if we fully digitise it we increase its value by a big percentage. All of a sudden your asset is worth more and easier to run. In a power plant, you can install and connect sensors at low cost to improve how you run and maintain the plant."

It is a strategy that is rapidly gaining momentum. Ganesh Bell, Chief Digital Officer, Power Digital Solutions, GE Power, said: "Over the last two years, there has been an increased awareness among our customers and a belief that if you collect all the data that's available and aggregate it and gain insights, you will find things that will allow you to operate and maintain differently, perform differently and even compete differently. More than 50-plus customers have now started on this journey."

Energy companies are showing that they are willing to embrace the use of technologies such as digitalisation, robotics and blockchain to help cut costs and adapt to a new energy reality. Now they have also accepted that their role in the future could be very different than it is today, and that the transition should be viewed as an opportunity instead of a threat.



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