

# THE ENERGY INDUSTRY TIMES

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# E.On and RWE reposition in response to changing market



Teyssen and Schmitz; weathering the transition

Germany's two leading utilities have agreed a deal, which they hope will equip them for the future energy market and improve their strength in the international arena. **Junior Isles**

German energy giants E.On and RWE are attempting to improve their competitiveness in the international energy market through a deal that will help them navigate the challenges of a sector that is going through rapid transformation.

The former rival utilities recently agreed a deal that will see E.On first acquire renewables company Innogy from RWE. The acquisition will be followed by a series of asset swaps that will leave E.On focused on regulated energy networks and retail customers, and RWE as a leading energy producer with ownership of the renewables businesses of both E.On and Innogy.

Under the terms of the agreement, E.On will buy RWE's 76.8 per cent stake in Innogy, the renewables energy business that was spun out in 2016,

and table a €5.2 billion all-cash offer worth €40 a share to Innogy's minority shareholders.

E.On will then transfer back Innogy's renewable energy assets as well as its own to RWE. This will see E.On become Europe's largest operator of electricity grids and retail, while RWE will be the continent's second-largest producer of green energy.

The total value of both transactions stands at up to €60 billion, with E.On's takeover of Innogy accounting for €43 billion and the assets handed over to RWE in the second stage valued at €17 billion.

In addition to the transfer of E.On's renewables businesses, RWE will receive a 16.67 per cent stake in E.On. Additionally, E.On has agreed to transfer a minority stake held by its subsidiary PreussenElektra in Emsland

and Gundremmingen nuclear power plants, currently being operated by RWE.

There will also be a transfer of Innogy's stakes in the Austrian energy supplier Kelag, as well as renewables and gas storage businesses to RWE. The transfer of businesses and participations will be calculated from 1 January 2018. E.On will receive a cash payment of €1.5 billion from RWE as part of the contract.

The transaction is expected to close by the end of 2019.

E.On and RWE had carried out restructuring of their businesses as a result of significant upheaval in Germany's energy sector. Both were hit hard by the so-called *Energiewende* – an accelerated shift towards renewables following the decision to close all its nuclear power plants in response

to the Fukushima Daiichi nuclear power plant disaster in Japan.

The two utilities decided to break themselves up. RWE spun-off its green energy operations into Innogy, while E.On created separately listed Uniper to hold its conventional power business. In January, it sold its 47 per cent stake in Uniper to Fortum, the Finnish utility.

Explaining this latest move, E.On CEO Johannes Teyssen said that E.On's business segments (Energy Networks, Customer Solutions, Renewables) all have growth potential.

"The new energy world is green, digital, and distributed. Our customers expect us to provide them with innovative solutions that improve their lives. We intend to meet these

Continued on Page 2

## Fossil fuel firms cannot afford to ignore climate goals

Fossil fuel companies risk wasting \$1.6 trillion by 2025 if they base their business on emissions policies already announced by governments instead of international climate goals.

According to a report released by Carbon Tracker, which models the International Energy Agency's 1.75°C scenario for the first time, these companies risk spending money on oil, gas and coal projects that will become uneconomic if the world accelerates its efforts to tackle climate change.

Carbon Tracker compared demand for fossil fuels in a 1.75°C world – the mid-point of the Paris Agreement – with demand in a 2.7°C world, looking at oil, gas and coal production to 2035 and capital investment to 2025.

The \$1.6 trillion figure represents

the difference between the estimated \$4.8 trillion of investment needed to meet global fossil fuel demand between 2018 and 2025 under current climate policies and the \$3.3 trillion that would be required if the Paris agreement on reducing carbon emissions was fully implemented.

The greatest risk is in the oil sector, where \$1.3 trillion of investment would become uneconomic if governments introduced measures such as carbon taxes and stricter emissions regulation. Nearly \$230 billion of gas projects and more than \$60 billion of coal investment were also threatened, claims the report.

Private investors are at greater risk than state-owned companies. They are exposed to 88 per cent of the spending on unneeded oil and gas

projects. For coal, private sector capital spending in a 1.75°C world is half the level under 2.7°C. The report notes that investors are increasingly focusing on an "orderly transition" which minimises financial disruption in the process.

"At present, governments' policies fall a long way short of the ultimate goal committed to at Paris, but we should expect a ratcheting up of international efforts. Companies that misread the signals and overinvest in marginal oil, gas and coal projects based on a false sense of security could destroy shareholder value worth billions of dollars," said report author Andrew Grant, senior analyst at Carbon Tracker.

Last month a group of 22 Commonwealth scientists urged stronger

action on climate, releasing the 'Consensus Statement on Climate Change' ahead of April's Commonwealth Heads of Government Meeting (CHOGM) in the UK. It includes signatures from the official science academies of Australia, India, Canada, New Zealand, Bangladesh, South Africa, the UK, and Pakistan, among others.

The statement warns that countries are not doing enough to limit global temperatures to below 2°C as intended by the Paris Agreement.

"Even if all countries meet their current commitments to greenhouse gas emission reductions, a global temperature rise of more than 3°C above pre-industrial levels is projected by 2100 according to current data," it said.

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expectations. We have a clear customer focus, the right capabilities, and also the financial strength to further enlarge our strong position in the new energy world on our own until the closing of the transaction with RWE.”

Some say the deal signals the end of the era of integrated utilities that generate electricity, own the supply grid and control the relationship with the customer. “The transaction shows that the industry has given up on the value of vertical integration,” said one analyst, who added that similar deals are inevitable.

The new E.On will be the first formerly integrated European energy company to focus entirely on meeting the demands of its around 50 million customers across Europe, with intelligent networks and innovative customer solutions at its heart.

After the integration of E.On’s and Innogy’s renewables businesses, RWE will run CO<sub>2</sub>-free generation capacity amounting to approximately 8 GW from offshore and onshore wind as well as hydro and photovoltaics. RWE will thereby become number three in Europe in the renewable energy business as a whole, and number two in wind power. This opens up attractive growth prospects, with a concrete project pipeline in Europe and the US.



**Laschet: With this we have two strong companies competing internationally**

Rolf Martin Schmitz, CEO of RWE said: “Renewable and conventional energy generation are two sides of the same coin when it comes to the transformation of the energy world. The expansion of CO<sub>2</sub>-free electricity generation will increasingly evolve from a regulated sector to a normal competitive market. Significant size is crucial for success in this future-orientated business. At the same time, security of supply remains the beating heart of any future-proofed industrial society.”

The deal should reassure investors and creditors by creating two less complex companies which would also be more resistant to foreign takeover.

According to European credit rating agency Scope Ratings, the breakup of Innogy with the allocation of different utility assets to E.On and RWE will simplify the two utilities’ corporate structures, thereby making it easier for investors and creditors to assess the corporates’ value and creditworthiness of the companies.

It also said the deal will reduce the risk of further intrusion by foreign companies into Germany’s power sector after a number of recent transactions.

Armin Laschet, Prime Minister of the federal state of North Rhine-Westphalia, where both E.On and RWE are based, told German television: “With this we have two strong companies competing internationally. That is also good for jobs in North Rhine-Westphalia.”

# India and France accelerate low-carbon transition

- Over \$2 billion pledged for solar projects
- Agreement on 10 GW Jaitapur nuclear plant



Junior Isles

The drive to decarbonise the energy sector, and in particular the acceleration of solar energy deployment, received a significant boost during a recent visit to India by a French delegation, which also saw the signing of a series of cooperation agreements between the two countries.

During the first summit of the International Solar Alliance (ISA) in New Delhi, which drew heads of government from more than 20 countries, Indian Prime Minister Narendra Modi pledged \$1.4 billion to support solar energy projects in Bangladesh and in developing countries in Africa.

Modi told the summit that India’s \$1.4 billion pledge would be used to support 27 new projects in 15 developing nations.

France committed €700 million (\$865 million) in loans and donations designed to accelerate the global transition to a low-carbon economy. This pledge brings France’s total investment to €1 billion. Macron, who has

positioned himself as a climate crusader, told the summit that the alliance needed \$1 trillion to achieve its ITW target by 2030. Speaking at the meeting, President Macron said: “We need to remove all obstacles and scale up.”

But even as the Indian prime minister welcomed world leaders to the conference, there was evidence that the spectacular growth in the Indian solar market was slowing.

The looming threat of safeguard duty and anti-dumping duty on imports of solar panels and modules had begun impacting participation in solar auctions, leading to postponement of two recent auctions.

In a January 5th recommendation to the finance ministry, the Directorate General of Safeguards (DGS) said solar cells are “being imported into India in such increased quantities and under such conditions so as to cause or threaten to cause serious injury to the domestic industry manufacturing like or directly competitive products”.

Acting on an application filed by an association of five domestic cell and

module makers, the DGS recommended a 70 per cent provisional Safeguard Duty on the imports of solar cells whether or not assembled in modules or panels.

In mid-March, however, a Parliamentary panel ruled that there is no valid ground for imposing the duty, noting that the imposition of such a duty would affect the viability of existing projects and dampen investor sentiment.

The government will now amend bidding rules to allow pass through of any duty hike and will ensure that the rules are not implemented retrospectively. With pass-through of any hike in duties, solar power developers will be allowed to increase the tariffs based on those under which they bagged the projects, so as to recover the extra cost.

The news will come as a relief to solar project developers and will help India keep its climate change commitments, set under the Paris Agreement, on track.

Nuclear will play a key role in achiev-

ing its CO<sub>2</sub> emission reduction targets and the country’s nuclear plans also received a boost during meetings with the French delegation.

Notably, Jean-Bernard Levy, EDF Chairman and CEO, and Satish Kumar Sharma, Chairman and CEO of Nuclear Power Corporation of India Limited (NPCIL), the government-owned Indian energy company, signed an Industrial Way Forward Agreement for the implementation of six EPR reactors at the Jaitapur site. Jaitapur is set to be the biggest nuclear project in the world, with a total capacity of around 10 GW.

The agreement defines the project’s industrial framework, the roles and responsibilities of the partners, as well as a planned timetable for the next steps.

The framework agreement has provisions for a preliminary tender by EDF to be submitted in the weeks following its signature on March 10th, with the objective of producing a binding EDF tender towards the end of 2018.

## International community courts Saudi energy sector

The international community is keen to work with Saudi Arabia as the kingdom works towards its Saudi Vision 2030.

In early March the UK and Saudi Arabian governments signed a Memorandum of Understanding (MoU), which commits the two countries to working together to develop technologies that will reduce carbon emissions. The UK and Saudi Arabia will share technical knowledge and expertise on clean energy, including smart grids, electric vehicles and carbon capture usage and storage (CCUS).

The agreement forms part of the UK’s industrial strategy and Saudi Arabia’s Vision 2030, which is aimed at diversifying the country’s energy mix and grow its renewable energy sector.

Commenting on the MoU, Saudi Arabia’s Minister for Energy, Industry and Mineral Resources, Khalid A.

Al-Falih said: “Through our Vision 2030, Saudi Arabia has a blueprint to guide its future development through diversifying our energy mix, expanding on key industries and mining opportunities, as well as investing on science and innovation to meet current challenges.”

In addition to renewables, diversification of that energy mix calls for the development nuclear. Last month, the Kingdom was reportedly assessing submissions for nuclear reactors from five bidders from the United States, France, South Korea, Russia and China.

According to *The Arab Weekly*, the USA’s Trump administration is pressing the government of Saudi King Salman bin Abdulaziz Al Saud to award contracts for the engineering, procurement and construction of two nuclear power reactors to a consortium led by US firm Westinghouse Electric and its

South Korean partners.

The nuclear reactors will be able to produce 2.2-3.3 GW each and will be combined into one power station to be operational by 2027.

The United States, traditionally requires a country to sign a civilian nuclear cooperation agreement – referred to as “a 123 Agreement” – that allows participation by US firms in a nuclear project and transfer of US nuclear technology only if the foreign country accepts specific limits on uranium enrichment and spent fuel reprocessing. Washington has 123 Agreements with 23 countries as well as Taiwan and Euratom, a group of 27 nations.

Saudi Arabia, however, objects to accepting a gold standard 123 Agreement such as signed by the United Arab Emirates, arguing that uranium enrichment is an issue of national sovereignty. Falih has said that the king-

dom’s uranium resources were being explored and were proving promising and has therefore not ruled out enriching its own uranium for “self-sufficiency” purposes.

Riyadh insists that its pursuit of nuclear power is strictly for meeting domestic electricity demand and freeing up more crude for export. It plans to construct as many as 16 nuclear reactors by 2032 to produce 17.6 GW at a cost of \$80 billion.

The kingdom says it will be awarding contracts for the construction of the first units by the year-end.

“By April, we will sign a project development agreement with two to three selected vendors,” remarked Abdulmalik Al Sabery, a consultant in the business development department at King Abdullah City for Atomic and Renewable Energy. “We are going to have only one winner that will be building the two reactors.”

## US energy storage set to triple as storage rules change

US deployments of energy storage systems will nearly triple this year thanks to sharply lower costs and state policies that support the case for installing batteries in homes, businesses and along the power grid.

According to a report by GTM Research and the Energy Storage Association, the market will grow by 186 per cent to 1233 MWh of storage from 431 MWh; this compares with a 27 per cent increase in 2017.

While the growth can be partly attributed to some large projects that had been expected for 2017 but were pushed into the early months of 2018, GTM analyst Ravi Manghani, claimed

that the market for batteries in homes and businesses is finally taking off.

Large systems for utilities are still the biggest segment of the market, and more utilities are including storage in their solicitations for solar projects, Manghani said, adding that a year from now he would expect most solar project solicitations to include a storage component.

The likelihood of this scenario was strengthened by an announcement in mid-February following a ruling that opens participation in organised wholesale markets to electricity storage resources.

In a landmark rulemaking the Fed-

eral Energy Regulatory Commission (FERC) issued Order 841, which requires each regional transmission organisation (RTO) and independent system operator (ISO) to revise their tariffs to establish a participation model that recognises the physical and operational characteristics of electric storage resources and facilitates the participation of those resources in the organised markets.

In response to concerns that the ability of the electric system to provide frequency response following a system disturbance is falling across the US, FERC also took the decision to change its generation interconnection

requirements.

Non-synchronous generators (typically renewable generation) will for the first time be required to have equipment that enables the generator to provide frequency response.

Previously, only synchronous generators were required to have that capability because of concerns that non-synchronous generators were not technically capable of providing that service.

FERC found that with recent technological developments there is no longer a reason to treat synchronous and non-synchronous generation differently on this issue.



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# Growing energy storage market fuelling new strategies

■ GE launches storage staple ■ SNC-Lavalin bets on LAES

Siân Crampsie

Energy storage solution providers are racing to gain a competitive advantage in the fast-growing US energy storage market.

Renewable energy penetration in particular is driving rapid growth in the energy storage market, which is expected to triple in size this year.

The growing value of the market – both in the front-of-meter and behind-the-meter segments – is fuelling new strategies by tech companies.

Last month GE launched a new energy storage platform called GE Reservoir that will, the company says, expand its existing footprint in the energy storage space.

Meanwhile Highview Power and

SNC-Lavalin have announced a collaboration to deploy liquid air energy storage (LAES) systems in North America.

GE's Reservoir system is a modular energy storage solution based on a 1.2 MW/4MWh battery 'building block' incorporating GE's Battery Blade and other key technologies from across the group's portfolio. The Reservoir already has a 20 MW pre-launch commitment, GE said.

"The energy landscape is undergoing an unprecedented paradigm shift, as the growth of renewables, decentralisation of power and digitisation create both new challenges and opportunities in how power is generated, transmitted and distributed," said Russell Stokes, President and Chief Executive Officer

of GE Power. "GE's Reservoir delivers the new type of energy system that customers are looking for to help manage electricity's next chapter."

Last year GE launched a hybrid electric-gas turbine integrating an LM6000 gas turbine and battery storage system to enable spinning reserve without fuel-burn. It has also devised other hybrid power solutions using batteries with wind and solar systems.

Last month the Energy Storage Association (ESA) and GTM Research issued forecasts indicating that grid-connected energy storage in the US would see a near three-fold increase to 1233 MWh in 2018.

This strong growth will push the sector's market value over \$1 billion by 2019, and continue exponentially

in the years ahead. At the moment, it is valued at \$300 million, but by 2023, it could be worth \$3.8 billion.

Energy storage in the US has been helped by "falling costs and favourable policies" at the state level, according to Ravi Manghani at GTM Research. The major markets for the technology, such as California, Massachusetts and New York, have all created targets to grow the technology, and provided tax incentives to get there.

Kelly Speakes-Backman, CEO of ESA, said that "policies and regulatory frameworks that level the playing field will further encourage energy storage deployment throughout 2018 and beyond as the industry builds toward a goal of realising 35 GW by 2025".

Battery energy storage deployments dominate the market, but other technologies are hoping to find a foothold. The agreement between Highview Power and SNC-Lavalin to work together to deploy Highview's LAES solution is aimed at satisfying the requirement for long-duration energy storage from utilities and independent power producers.

"Long duration energy storage such as Highview's LAES is one of the key technologies that will enable our utility and large industrial facility clients to maximise the value of their renewable energy investments through increased levels of integration with the grid," said Marie-Claude Dumas, President of Clean Power at SNC-Lavalin.

## Venezuela rations power in western states

Prolonged energy shortages in Venezuela has forced the country's government to impose electricity rationing in six states.

The government announced in mid-March that rationing would start in the states in the western part of the country in response to recurring power outages caused by low water levels in hydroelectric reservoirs.

The shortages have been caused by a prolonged drought in the country and have exacerbated the existing economic crisis. The capital city, Caracas, has not yet been affected by rationing but power shortages are already commonplace across the country, according to local reports.

The rationing will last for two weeks and will affect the states of Tachira,

Merida, Trujillo, Portuguesa, Barinas, and Apure for four hours per day, the government said. Rain in the west of the country had been lower than average for around six months, it added.

Frequent blackouts in the country – some of them lasting for days – have triggered protests in some states, local media has reported, and have also had a severe impact on local services such as schools and hospitals, as well as businesses.

Venezuela has an installed electricity generating capacity of around 32 GW, of which around half is hydropower and much of the remainder based on natural gas and oil. Peak electricity demand is around 14 000 MW, according to state-run utility Corpoelec, down from 16 000 MW two years ago.

## Solar market shrinks but outlook strong

The USA's solar energy market remained strong in 2017 in spite of the uncertainty caused by the trade case, according to the Solar Energy Industries Association (SEIA).

Some 10.6 GW of solar photovoltaic (PV) capacity was installed in the USA in 2017, down 30 per cent from 2016, when a record 15 GW was installed, according to new research from SEIA and GTM Research. A further 10 GW is expected to be installed in 2018, the organisations say.

In 2017, installations in the residential and utility-scale segments fell year-on-year. However, there was an "explosion" in the non-residential sector, which showed a 28 per cent growth, GTM said. This was largely due to

community solar projects in states such as Minnesota and Massachusetts.

The 2017 decline in the utility segment, where installations were down to 6234 MW, was largely expected, GTM Research and SEIA said. Residential installations fell 16 per cent to 2227 MW. This segment is forecast to see a slight rebound in 2018.

GTM Research says that the imposition of tariffs on solar panel imports will impact the US market in the next few years. It has reduced its base-case forecast for 2018-2022 by 13 per cent in response to the trade case. Total installed US PV capacity, which has now reached 53.3 GW, however, is still expected to more than double over the next five years, GTM said.

## Chile sees potential in blockchains

The Chilean National Energy Commission says that blockchain technology could help the country to run and monitor the electricity grid.

The Energy Commission has announced plans to use blockchain to certify the quality and certainty of the open data of the national energy sector.

The move would put Chile at the forefront of the use of blockchain in the energy sector. So far the use of the technology in the energy sector has been limited to pilot projects and small-scale projects by start-up companies.

The National Energy Commission says that it will use blockchain as a

digital notary, allowing it to certify the information it provides to third parties in an open data portal. The use of blockchain would increase confidence in the transparency and accuracy of the information provided, it argues.

Blockchain is a peer-to-peer digital ledger that allows information to be securely and transparently stored without the need for a central broker or information manager. Information that is held on the ledger cannot be modified.

"Public information is an important input for the decision making of investments and energy projects and many of our users use this information

to decide technical, economic and labour aspects," the Energy Commission said. "That is why, through the use of this technology, we will raise the levels of trust of our stakeholders, investors and the general public that consumes the data delivered at [www.energiaabierta.cl](http://www.energiaabierta.cl)."

■ Acciona has signed an agreement with the National Mining Company of Chile (ENAMI) to supply it with renewable energy for its operations. Acciona will build a new solar photovoltaic (PV) plant in the north of Chile to fulfil the contract, which covers ENAMI's plants in the regions of Antofagasta, Atacama and Coquimbo.

## USA puts cyberattacks down to Russia

Russian intelligence agencies are among those responsible for cyberattacks on the US energy grid, according to the US government.

US national security officials say the FBI, the Homeland Security Department and intelligence agencies have

determined that energy industry targets were being deliberately chosen and that Russian agencies had conducted the attacks in order to carry out network reconnaissance.

The Department of Homeland Security and FBI said in a security alert

that a "multi-stage intrusion campaign by Russian government cyber actors" had targeted the networks of small commercial facilities "where they staged malware, conducted spear phishing, and gained remote access into energy sector networks."



- Smart grid and smart cities MoU signed with EDF
- Waiver of transmission charges for wind and solar extended

Syed Ali

Indian power distribution company Tata Power Delhi Distribution (TPDDL) is to cooperate with Electricite de France (EDF) and its wholly-owned subsidiary Enedis (a French electric utility company responsible for the management and development of 95 per cent of the electricity distribution network), to explore opportunities related to smart grid technology in the country.

It is hoped that a Memorandum of Understanding (MoU) signed between the two organisations in March, will help India achieve its goals in developing its electricity network and smart sustainable cities.

Smart cities and smart grids are

increasingly being seen as a key to India's economic and social growth. Accordingly, the Indian government is undertaking several schemes for development and re-development of the distribution network, along with the Smart Cities Mission launched in June 2015.

Smart cities and the use of smart grids will support the integration of renewables as India works towards its target of 175 GW of renewable generating capacity by 2022. Of this total, 60 GW would come from wind and 100 GW from solar, which, due to their variability, need smarter networks for optimum utilisation.

In an attempt to boost renewables deployment, in February the government extended the waiver of inter-

state power transmission charges and losses for the solar and wind power projects commissioned by March 31, 2022.

Previously, the waiver was only available to solar and wind power projects commissioned by December 31, 2019, and March 31, 2019, respectively. The waiver was available for a period of 25 years from the date of commissioning.

"For generation projects based on solar and wind resources, no inter-state power transmission charges and losses will be levied on transmission of the electricity through inter-state transmission systems for sale of power by such projects commissioned till March 31, 2022," stated an order issued by the power ministry.

## Japan eyes new nuclear plant

Almost exactly seven years after the disaster at the Fukushima Daiichi nuclear power plant, Tokyo Electric Power Company (Tepco) Holdings Inc. and other major utilities are to start talks on jointly building and operating a nuclear power plant in north-eastern Japan.

According to sources quoted by the *Japan Economic Newswire*, the plan involves Tepco's Higashidori nuclear power plant in Aomori Prefecture, whose construction was suspended following meltdowns at the firm's Fukushima Daiichi power plant in

March 2011. Tohoku Electric Power Co., Chubu Electric Power Co., and Japan Atomic Power Co. are expected to join, according to the sources.

Kansai Electric Power Co. is also considering joining the group to discuss the role of each utility and how to shoulder the huge costs related to the Higashidori plant, they said.

The government, which holds the majority of Tepco's voting rights through a state-backed bailout fund, is expected to support the move.

Tepco, which began constructing the Higashidori plant in January 2011,

hopes to compile a joint venture plan around fiscal 2020. The utility has been asking other power companies since late last year to join the construction of the Higashidori plant.

Many utilities, however, remain wary that teaming up with the crisis-hit Tepco could increase their burden of shouldering plant decommissioning costs in the future. The Japanese utility has been struggling under the huge compensation payments related to the Fukushima Daiichi crisis and plant decommissioning costs, estimated at nearly \$200 billion.

## Sluggish demand halts Indonesian projects

Lower than forecast power demand is forcing Indonesia to drastically curtail its power generation capacity addition programme.

Syed Ali

Indonesia's state electricity company PT PLN has cancelled the allocation of around 22 000 MW of power projects, due to sluggish electricity demand in 2017.

In the previous version of its 2017-2026 electricity procurement business plan (RUPTL), PLN forecast electricity consumption to increase by an average 8.8 per cent/year over this period, requiring the development of 77 900 MW of new power projects.

However, electricity sales grew by only 3.6 per cent in 2017, raising concerns over a potential oversupply: the revised version of its 2017-2026 RUPTL now plans the development of 56 000 MW of new power projects, based on an average electricity consumption growth of 6.9 per cent/year over the next decade.

Among the 21 900 MW of power projects removed from the plans, PT PLN scrapped around 10 000 MW of gas fired and CCGT projects, 6600 MW of renewable projects and around 5000 MW of coal fired power projects.

"The slashed allocation [of around 22 000 MW] is put in a potential list

and can only be developed if we already have the demand," said Energy and Mineral Resources Minister Ignasius Jonan.

PLN says, however, that expansion plans could be revised again if electricity demand suddenly increases later.

Indonesia now plans to commission only 20 GW of power plants under the 35 GW capacity programme by 2019.

One project that is still going ahead is the 1760 MW combined cycle gas turbine (CCGT) power plant in Cilamaya, about 100 km east of Jakarta. Capable of providing electricity to 11 million households, it will be the country's largest CCGT plant when it is completed in 2021.

A KRW510 billion (\$476.4 million) contract to build the plant was awarded last month to Samsung C&T Corp. for the construction unit of South Korea's Samsung Group.

The Korean company said its consortium of GE Power and Jakarta-based PT Meindo Elang Indah clinched the order from PT Jawa Satu Power, a joint venture between state-owned energy giant Pertamina and Japanese companies Marubeni and Sojitz Corporation.



## Vietnam plans direct PPAs for renewable energy

The Ministry of Industry and Trade (MoIT) has confirmed that a mechanism to allow businesses to buy power at competitive prices from renewable energy generators will be piloted in 2018.

The mechanism, aimed at attracting investment in the renewable energy sector, will enable businesses in Vietnam to enter into contracts directly with renewable energy generators. Speaking at the annual Vietnam Business Forum (VBF), Deputy Minister of Industry and Trade Do Thang Hai said that the pilot will be implemented in the fourth quarter of 2018 at the latest.

The MoIT previously confirmed that it was prioritising the study of direct power purchase agreements (DPPAs), and that the Electricity Regulatory Authority (ERA) has been assigned to work with the United States Agency for International Development (USAID) to implement a technical assistance programme on DPPAs.

The MoIT has asked for clear milestones and a detailed schedule of DPPA implementation for the review and approval of the ministry and government.

"In terms of capacity, it has been agreed that the pilot should be 300 MW," Hai said.

The MoIT is currently working with General Electric (GE) on a 1000 MW wind project and has a PPA in place with GE for a 200 MW wind power project.

The MoIT is also concentrating on feed-in tariffs (FiT) for wind power. The ministry's Renewable Energy Department director general Pham Trong Thuc, said that the ministry submitted the latest proposal on FiT for wind power in August 2017 for the government's review and approval. The drafted tariffs are higher than those previously mentioned in the prime minister's Decision No.37/2011/QĐ-TTĐ.

The draft suggests that the newly

proposed tariffs will be valid until December 31, 2020, after which new tariffs will be imposed or bidding will be conducted.

Separately, in March the Prime Minister also approved the National Program on Demand Side Management (DSM) for Vietnam 2018-2020 and orientation to 2030.

The specific goal of the DSM programme is to reduce the peak load demand of the national power system (compared with load demand forecast in the National Power Development Planning VII) by 300 MW by 2020, 1000 MW by 2025 and 2000 MW by 2030, and to increase the load factor

or utilisation rate of the national power system by 1-2 per cent in the 2018-2020 period and by 3-4 per cent during the 2021-2030 period.

■ Thailand's largest solar energy company, Superblock Public Co. Plc, plans to invest \$1.76 billion on installing 700 MW of wind farms in Vietnam. The first phase of the investment will cost \$654.3 million and consist of three near-shore farms in the Mekong Delta, with 142 MW of capacity in Bac Lieu province, 98 MW in Soc Trang province, and 100 MW in Ca Mau province. Construction has already begun and the sites are expected to be operating by 2020.

# UK gets tough on energy prices

Consumers will be protected by an energy price cap until at least 2020 in a move designed to restrict energy companies' profits.

Siân Crampsie

UK regulators and lawmakers are cracking down on energy prices to help protect consumers from rising bills.

The government last month introduced new legislation to cap energy tariffs for households, while regulator Ofgem unveiled proposals to dramatically cut the rate of return that network owners can earn on their assets.

The government's Domestic Gas and Electricity (Tariff Cap) Bill will put in place a requirement for Ofgem to cap the most expensive domestic energy tariffs until at least 2020. It has also proposed that green energy tariffs should remain exempt from the cap.

The government will have to consult on the exemption of green energy tariffs, which tend to be more expensive, from the cap, but said that the measure would go ahead if Ofgem "is satisfied that the tariff supports the production of renewable energy".

The cap is designed to protect around 11 million households in England, Wales and Scotland that are on the highest energy tariffs and will be in place by the end of 2018. The government said that some consumers are paying up to £300/year more than they need to because they are on so-called 'standard variable' or default tariffs.

"It's often older people or those on low incomes who are stuck on rip-off energy tariffs, so today we are introducing legislation to force energy companies to change their ways," said Prime Minister Theresa May.

Greg Jackson, CEO of Octopus Energy, an independent energy supplier that lobbied for the introduction of a price cap, welcomed the bill. "We are delighted the government is bringing forward this vital legislation," said Jackson. "The power imbalance between customers and companies has stifled competition and led to rip off prices and cynical loyalty penalties which we hope the government will also address with this legislation."

Lawrence Slade, CEO of industry group Energy UK said that the number of energy suppliers was growing, reflecting increased competition and consumer choice in the market. "With a record 1 in 6 customers switching last year and over 60 suppliers to choose from, the energy market is changing rapidly and has never offered so much choice," said Slade. "It's vital the cap doesn't halt the growth of competition which is helping customers to find a better deal and save on their energy bills."

Ofgem said that its plans to limit energy network profits would save households £5 billion over five years. The regulator's plans involve limiting the amount of revenue that companies operating gas and electricity networks, such as UK Power Networks, SSE Electricity Networks and SP Energy Networks, can return to shareholders.

The operators of Britain's electricity and gas grids claim around £250 a year from an average annual energy bill of £1100 to maintain the pipes and wires that deliver energy to 30 million homes. Under Ofgem's plans, customers should be able to save £15-£25 per year.

The Energy Networks Association (ENA) says that investors in network companies require higher returns because of the challenges those companies are facing in the changing energy sector.

"Energy networks are the nerve-centre of a smarter, cleaner energy market, responsible for delivering a range of exciting new services for our homes, businesses and communities," said David Smith ENA's CEO. "Balanced regulation is fundamental to delivering these and the price control system should evolve to suit the changing needs of consumers. [The price control] must deliver that whilst being founded on the principles of transparency and stability to provide predictability for investors, innovators and consumers alike."

The Austrian government has launched legal proceedings against the European Commission in protest at plans to expand the Paks nuclear power plant in Hungary. The lawsuit is aimed at the approval by the Commission of Hungarian state subsidies supporting the construction of two new units at Paks, which is located 100 km south of Budapest in central Hungary. The project has received all of its approvals and is due to start operating in 2023. The Paks expansion project will include the installation of two VVER-1200 reactors by Russian firms. Russia has also agreed to a state loan of up to €10 billion to finance 80 per cent of the project. The legal case will be heard by the European Court of Justice.

# Austria embarks on Paks action

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The twin Hollandse Kust Zuid offshore wind farms in the Dutch North Sea will be the first in the world to be built without public subsidy. Vattenfall's zero-subsidy bid was in part enabled by a pledge by the Dutch government to take on some of the risks associated with the project.

These projects, and those in Germany, will benefit from advancements made in offshore wind energy technology, including the use of larger wind turbines. The French Round 1 and Round 2 projects are due to receive a strike price of €200/MWh, including grid connection. The offshore wind sector in France says that projects are more expensive to develop there because of the long development times, and also argues that retroactive changes to license conditions could be damaging for the sector as a whole.

The Round 1 projects, awarded in 2012, include Saint-Nazaire, Courseulles-sur-Mer, and Fécamp, developed by an EDF-led consortium, and Saint-Brieuc, developed by an Iberdrola-led consortium. Round 2 projects were awarded in 2014 and include the 496 MW Dieppe-Le Tréport and the 496 MW Ile d'Yeu et de Noirmoutier projects, being

# France examines falling offshore wind costs, as Dutch see zero-subsidy tender

Government seeks tariff renegotiation

Vattenfall wins zero-subsidy Dutch tender

Plans by the French government to renegotiate the feed-in tariffs awarded to six offshore wind farms have been rejected by the French Senate.

The Senate has voted against legislation introduced by the government to renegotiate the terms of the six projects, which were awarded in the country's Round 1 and Round 2 tenders and which total almost 3 GW in capacity.

The government submitted its proposals last month and included plans to cancel the projects and re-submit them for new tenders in the event that renegotiations failed.

The move was made in response to rapidly falling costs in the offshore wind power sector, reflected in more recent tenders held in Germany and the Netherlands.

Last month the Dutch government awarded Vattenfall licenses to build two offshore wind farms with a combined capacity of 700 MW in a zero-subsidy tender.

The Dutch tender was only open to zero-subsidy bids and follows on from a tender held in Germany last year that awarded Ørsted and EnBW licenses to build wind capacity without federal support.

The twin Hollandse Kust Zuid off-

shore wind farms in the Dutch North Sea will be the first in the world to be built without public subsidy. Vattenfall's zero-subsidy bid was in part enabled by a pledge by the Dutch government to take on some of the risks associated with the project.

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developed by a consortium led by Engie.

In Holland, Vattenfall will bring the Hollandse Kust Zuid offshore wind farms on-line by 2022.

"Thanks to drastically lower costs, offshore wind farms are now being constructed without subsidy," Dutch Minister of Economic Affairs Eric Wiebes said. "Innovation and competition are making sustainable energy cheaper and cheaper, and much faster than expected, too."

Wiebes noted, however, that while the tender gives confidence for future tenders in the country, there is no guarantee that these can also be realised without a subsidy. In a letter to the House of Representatives, he noted that cost factors and market conditions that are favourable now may change.

Hollandse Kust was the third of five tenders being held by the Dutch in a push to create 3500 MW of offshore wind power by 2023.

WindEurope CEO Giles Dickson said: "This news shows zero-subsidy bids are possible for some developers in some markets not least where governments take on and manage a share of the project risk."

# I-SEM launch will boost renewables



Ireland's planned new all-island electricity market will bring new opportunities for new and renewable energy technologies, according to new research.

Analysis by Aurora Energy Research indicates that the introduction of the Integrated Single Electricity Market (I-SEM) will push a shift towards a greener, more flexible energy system employing batteries, renewables and

other smart technologies.

The I-SEM reforms are designed to encourage competition, improve energy security and boost renewable energy development and help the island of Ireland meet its renewable electricity target of 40 per cent by 2020.

Measures include the removal of subsidies for peat generation, the establishment of a competitive capacity

market, and swift implementation of a new renewables support scheme.

The new market design will mean that the worst polluting and most expensive plants will be forced to compete with cheap renewable providers, while battery energy storage projects are expected to play a significant part in the first capacity market auction.

I-SEM is due to launch officially in May 2018.

## International News

# South African renewables programme stalls again

■ Last-minute legal challenge halts PPAs ■ Coal lobby fears impact of renewables

Siân Crampsie

Plans to complete the signing of delayed power purchase agreements (PPAs) for 27 renewable energy projects in South Africa have been held up by a legal challenge.

South African utility Eskom was set to sign the contracts in mid-March after a two-year delay but was stopped by a request for an urgent interdict at the high court by a union and a civil society.

The National Union of Metalworkers of South Africa (MUNSA) and Transform RSA applied for the interdict at the North Gauteng High Court, arguing

that the signing of the PPAs would result in the closure of coal fired power plants in South Africa and an increase in electricity prices.

The South African Wind Energy Association (SAWEA) said that the legal challenge to the contract signing would delay investments of over R59 billion and the creation of over 13 000 construction jobs. "Instead, the coal lobby has sought an urgent interdict to delay the conclusion of power purchase agreements, citing already debunked arguments relating to job losses, coal power station closures and rising electricity prices," said Brenda Martin, CEO of SAWEA.

SAWEA said that the PPA signing would re-awaken the country's Renewable Energy Independent Power Producer Procurement Programme (REIPPP), which was first initiated in 2011 with the objective of expanding South African energy supplies. "As has been demonstrated through three competitive bidding rounds, the renewable energy industry is in a strong position to contribute to the South African economy through job creation, advancing the transformation agenda, improving rural livelihoods and attracting foreign direct investment," SAWEA said in a statement.

Eskom in 2016 refused to sign

contracts with the 27 renewable energy independent power producers (IPPs) due to cost issues and excess power generation capacity, causing significant delays in the development of the projects, selected under bid windows 3.5, 4 and 4.5 of the country's REIPPP. The 27 projects include wind, solar photovoltaic (PV) and concentrated solar power (CSP) technologies.

SAWEA's Martin said in March that the falling cost of renewable energy should be a "clarion call" for South Africa to grow its green economy industrial base. "While South Africa's renewables programme has been stalled over the past three years, falling

prices for renewable power has led to exponential growth in investment and an accelerated energy transition globally," Martin commented.

Analysis by SAWEA shows that new renewables are cheaper than new thermal generation technologies in South Africa. The Department of Energy confirmed that the November 2015 expedited round bids for wind and solar power were 62c/kWh (2016 ZAR), significantly cheaper than new coal IPPs at around R1.03/kWh (2016 ZAR). The costs of new wind and solar PV power are even lower than Eskom's 2016/17 average price of electricity, by 20 per cent, Martin said.

## EU support to boost Nigerian energy access

Power supplies in Nigeria will receive a boost with an injection of up to €33 million from the Nigerian Energy Support Programme (NESP), a European Union initiative.

The finance will help Nigeria's efforts to improve the reliability of its electricity system as well as access to electricity and renewable energy capacity.

Under the NESP, up to 500 MW of solar photovoltaic (PV) capacity will be procured and installed to supply around 100 000 consumers in Nigeria. It will also support Nigeria's provision of stable data for electrification planning, sustainable on-grid and off-grid electricity, and support for energy efficiency.

The EU will provide €20 million of the finance, and Germany €13 million. The project, which is expected to last about four years, will be managed by German cooperation agency, Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ).

Nigeria has also announced a partnership between its Rural Electrification

Agency (REA) and the Rocky Mountain Institute (RMI) to bring down the cost of electricity generation through mini power grid across the country by over 60 per cent.

The agreement will support REA's off-grid electrification strategy, which aims to deploy 10 000 mini grids, and will be focused on addressing issues

such as system costs, demand stimulation and enabling policy. It will start with a three-day workshop bringing together leading global stakeholders and investors to create a roadmap for improved electricity supply that is both actionable and scalable.

Around 80 million Nigerians do not have access to the electricity grid.



## EBRD supports Turkey privatisation

■ Koc Holding buys hydro plants ■ New YEKA tenders in planning

The European Bank for Reconstruction and Development (EBRD) is supporting the privatisation of power plants in Turkey with a \$55 million dual currency loan.

The loan is made up of \$35 million in US dollars and the equivalent of \$20 million in Turkish lira and will be made to a subsidiary of Koc Holding, Entek Elektrik Uretim A.S.

Entek was the winning bidder of a competitive privatisation tender, and is acquiring two hydropower plants in Kahramanmaraş province in Turkey's southeast: Menzelet, with 124 MW capacity, and Kilavuzlu, with 54 MW. The plants supply energy to a Mediterranean area with a population of more than a million as well as important industrial installations.

The EBRD's loan is part of a dual-currency financing package of TRY1.05 billion (approximately \$260 million), to finance the acquisition. Other lenders include Garantibank,

Isbank, Akbank, Yapikredi, Unicredit and ICBC Turkey.

The loan has been hailed as a "major milestone" in Turkey's power plant privatisation process. "Privatisation is a key part of the Turkish government's strategy to liberalise the country's energy sector. Our investment supports the goal of increasing the participation of private suppliers in power generation and reinforces the role of renewable energy in the sector."

Bilal Tugrul Kaya, CEO of Entek Elektrik, said: "In 2017, Entek had a total 244 MW of installed capacity. With these two power plants, our installed capacity has almost doubled to 422 MW. The privatisation of Menzelet and Kilavuzlu is the largest acquisition of hydropower plants by a domestic investor in Turkey. In the forthcoming period, we are planning to continue our investments by considering a balanced and diversified generation portfolio."

The Turkish government is keen to attract private investment in the energy sector to boost energy security. Renewable energy has become a key part of its strategy and the government is reported to be preparing new renewable energy tenders for large-scale solar and wind energy projects.

Over the last two years, the Turkish government has awarded contracts for two so-called YEKA renewable energy projects, each with a capacity of 1 GW. Two more 1 GW tenders – one solar and one wind – are being planned, according to reports.

Last month GE signed a deal with Fina Enerji to work on eight potential wind projects in Turkey that will deliver up to 410 MW of capacity by the end of 2020. GE will supply its 3.8-130 wind turbines and will deliver long-term services for the projects, which will be located across the country and are planned to come on stream in the 2019-2020 period.

## India and China lead solar march



India and China helped to lead a near-30 per cent rise in global solar installations in 2017, according to Solar Power Europe.

The organisation's first estimates show that annual solar installations across the world reached 98.9 GW in 2017, up from 76.5 GW in 2016. China saw a 53 per cent year-on-year rise in installations, Solar Power Europe said.

In 2017 the solar market globally was fuelled by a rise in deployment in India, where 9.6 GW of new capacity was installed, and China, which was the global leader with a staggering 52.8 GW installed. The USA installed 11.8 GW.

Overall, China and India accounted

together for 63 per cent of overall global solar demand.

The European market saw a 28.4 per cent rise in installations with 8.6 GW of new capacity. Turkey led installations in Europe, with 1.79 GW connected to the grid. Germany was the second-largest market in Europe, with 1.75 GW, and the UK third.

Solar Power Europe said that the figures are preliminary, and that it plans to present final data for 2017, as well as forecasts to 2022 in June.

■ The International Renewable Energy Agency (Irena) and the International Solar Alliance (ISA) have signed an agreement to deepen their cooperation and accelerate solar energy deployment.

# Sempra completes Oncor deal

Sempra has been given the go-ahead by US regulators to complete the largest acquisition in the company's 20-year history.

The US energy company wrapped up the \$9.45 billion deal to acquire an 80 per cent stake in Oncor after receiving approvals from regulators in Texas. It said that the deal would create a utility holding company with the largest US customer base and would expand its presence in the massive Texas energy market.

The deal saw Sempra – which also owns San Diego Gas & Electric (SDG&E) and SoCalGas – buy out a stake in Oncor held by Energy Futures Holdings.

Energy Futures Holdings declared bankruptcy in 2014 after encountering financial issues caused by falling natural gas prices.

"We believe this is an excellent outcome for our company, our customers and our employees," said Oncor CEO

Bob Shapard in a statement. "Sempra Energy is a well-run company, and we believe they will be a strong, stable majority owner for Oncor and an excellent partner for Texas."

The deal has an enterprise value of about \$18.8 billion, including debt. Sempra has received financing commitments from RBC Capital Markets and Morgan Stanley to help fund the acquisition.

Oncor operates the largest distribution and transmission system in Texas, delivering power to more than 3.5 million homes and businesses while operating more than 134 000 miles of power lines. Sempra has 32 million natural gas and electricity consumers worldwide. In addition to SDG&E and SoCalGas, Sempra has subsidiaries and assets in Mexico and South America.

The company is also active in developing liquefied natural gas (LNG) projects in the Gulf Coast.



- Consortium targets May 2019 completion
- Agreement crucial to French restructuring

Siân Crampsie

Siemens and Areva SA are aiming to complete construction of the Olkiluoto 3 (OL3) nuclear power plant in Finland after settling a long-running dispute with the project's owners.

The Siemens and Orano (formerly known as Areva NP) consortium is responsible for building the 1650 MW OL3 plant for Finnish utility TVO but the project is 10 years behind schedule and over budget. The companies have agreed to pay €450 million to compensate TVO, while TVO has agreed to drop its lawsuits relating to OL3.

TVO will also pay back up to €150 million if OL3 is ready by May 2019, otherwise an additional compensation of up to €400 million will have to be paid by Siemens and Orano.

The dispute between the three firms was one of the longest-running and most bitter in Europe. French finance minister Bruno Le Maire said that the

agreement was a "decisive step" in "the restructuring process of the French nuclear industry".

TVO said that the deal was subject to certain unspecified conditions (which were due to be met some time in March) and added that it was therefore not certain if the settlement would take effect.

"TVO welcomes the agreement which ensures that the OL3 EPR project continues to have the necessary financial, technical and human resources for the completion and successful start-up of the plant and also settles other outstanding issues," said Jarmo Tanhua, chief executive.

TVO had originally launched proceedings against Siemens and Orano to claim €2.6 billion in compensation, while the Orano-led consortium issued a counter-claim of €3.5 billion.

In November 2017, TVO received a final and binding partial award under the framework of the ongoing

International Chamber of Commerce (ICC) arbitration proceeding.

Areva SA said that the agreement settled all disputes between the parties and gave them a "new cooperative mode" to complete the "notoriously difficult" project.

Areva CEO Philippe Soulié said: "All parties wanted to find an alternative settlement to the arbitration. This settlement will allow us all to refocus all our resources and energy towards completion of this new EPR. In less than 18 months, OL3 will deliver 1650 MW to the Finnish Electricity grid, with the highest safety standards in the nuclear world and zero CO<sub>2</sub>."

The OL3 plant is being built by a consortium of Areva GmbH, Orano and Siemens under a fixed-price turnkey contract. It was originally scheduled to start up in 2009 and cost €3.2 billion, but final estimates are that it will have cost three times that amount.

# Statoil goes green with name change



- Equinor launch planned for May
- Statoil enters Polish offshore market

Statoil says that its proposed new name – Equinor – will reflect the company's history as well as its future strategy.

The company's board of directors has proposed the name change to shareholders and is hoping to receive approval in May. All five unions representing Statoil employees – Industri Energi, SAFE, NITO, Tekna and Lederne – have already expressed support for the name change, Statoil said.

According to the company, which has its roots in the Norwegian oil and gas sector, the name Equinor is formed by combining "equi", the starting point for words like equal, equality and equilibrium, and "nor", representing Statoil's Norwegian origin. It also reflects the firm's strategy of transitioning to become a broad energy company.

"Equinor is a powerful expression

of who we are, where we come from and what we aspire to be," said Statoil's President and CEO Eldar Sætre. "We are a values-based company, and equality describes how we want to approach people and the societies where we operate. The Norwegian continental shelf will remain the backbone of our company, and we will use our Norwegian heritage in our positioning as we continue growing internationally within both oil, gas and renewable energy."

Statoil has already made a number of large-scale investments in renewable energy projects. Last month Statoil signed an agreement with Polenergia to acquire a 50 per cent interest in two early phase offshore wind development projects, Bałtyk Środkowy III (BSIII) and Bałtyk Środkowy II (BSII), in Poland.

The Bałtyk Środkowy II and III wind

farm areas are located in the Baltic Sea approximately 27 and 40 km from the port of Leba in water depths of 20-40 m. Statoil will manage the development, construction and operation of the projects.

In Europe, Statoil holds shares in the Arkona offshore wind farm in Germany, as well as Sheringham Shoal, Dudgeon and Dogger Bank in the UK, and is the majority owner and operator of the world's first commercial-scale floating wind farm, Hywind Scotland.

In December 2016, Statoil won the New York offshore wind lease sale, agreeing to pay \$42.5 million for rights to build an offshore wind farm, which could reach up to 1 GW of capacity. The company plans to sign a power purchase agreement for the project with a US utility by the end of this year.

# E.On, Nissan pool EV expertise

E.On and Nissan say they will pool their international expertise in the field of electric mobility, distributed generation and energy storage in a bid to expand in Europe and take advantage of growing business opportunities in the electric vehicle (EV) and vehicle-to-grid (V2G) markets.

The two companies have signed a strategic partnership deal to explore opportunities on pilot activities and commercial offers related to EV charging, V2G services and grid integration, as well as decentralised energy generation and storage solutions.

The agreement builds on an existing deal between the two firms in Denmark, where customers receive a complete package consisting of a charging station for their home and benefits from an energy flat rate to charge their

Nissan EV. "On this basis, we are now intending to expand the programme to other European countries in the near future to further support the sustainable electrification of mobility and home," E.On said in a statement.

Nissan said that the deal would help it with its ambition to position itself as "the go-to automotive partner for energy services". Its ultimate ambition is to provide free electricity for its EV customers, it added.

The partnership will also leverage Nissan's V2G infrastructure and advanced bi-directional charging technology that allows customers to optimise their energy use and costs. E.On's experience in solar and storage solutions for home owners will also allow the partners to offer renewable energy solutions to Nissan customers.



# Saudi Arabia-UK cooperation will help wean kingdom off oil dependency

The memorandum of understanding between Saudi Arabia and the UK on low-carbon technologies is very fortuitous. The leaders of both countries are seeking economic diversification – Theresa May to strengthen a diverse post-Brexit British economy and Prince Salman to realise his ambitious domestic reform. **Vicente Lopez Ibor Mayor**

Last month's visit by Prince Mohammad bin Salam to the UK was billed as a huge trade opportunity for both nations, with the Kingdom's Foreign Minister saying the visit could lead to up to \$100 billion worth of bilateral trade. Energy will almost certainly be a part of Britain's trade nexus with Saudi Arabia.

After all, for the best part of a century, Britain's relationship with Saudi Arabia has predominantly been about one thing: oil. It is fossil fuel that has propelled Saudi towards a steep development curve, regional leadership, and global indispensability.

But nothing lasts forever – and Saudi's ruling class know that. Just like the UAE, Saudi Arabia's new young leadership appreciates that oil dependency is not a sustainable future path for any 21st century economy.

One report by JP Morgan suggested that oil could begin drying up as early as 2030. That is almost certainly a severe exaggeration – renewables will not replace entirely fossil fuels any time soon, not in Saudi Arabia nor anywhere else.

But the whole world is going to have to face, in the coming generation, an energy sector that is clearly less focused on oil.

Increasing competitiveness and technological advances in solar energy, not to mention the high cost of domestic oil consumption, has made fossil fuel divestment a very real phenomenon in the Kingdom.

Changing energy sources will have significant economic, social and even political consequences for every citizen worldwide. But the effects – for better or for worse – will be felt even more acutely in Saudi Arabia and across the Middle East.

If the Kingdom cannot or will not adjust to the new phase, it could send the Arab world into a downward spiral of catastrophic decline and turmoil. Saudi and its oil is not only essential to political stability in the Gulf, and the benefits to global security and intelligence sharing that go along with that.

Saudi Arabia is also a key economic driver for poorer countries in the Middle East and elsewhere. Guest worker remittances sent home from Saudi are a lifeline for economies around the world. And Saudi Arabia's role in supporting other Arab countries going through difficult transitional stages (such as Egypt, which the Prince visited en route to London) is essential.

The good news is that the millennial Crown Prince Mohammad Bin Salman

understands this and wants to make his State a centre of global solar power. This is not a PR stunt – they are investing \$50 billion dollars in renewable energy in the next five years (the same amount the UK invests). As part of the Prince's grand Saudi Vision 2030, Saudi Arabia aims for renewables to account for as much as 10 per cent of all power generation in Saudi Arabia by 2023 – more than almost anywhere else in the world.

And at the same time as diversifying his nation's energy sources, Prince Salman is liberalising his economy. Many of the areas where he will need external partnerships are domains of British expertise – technical competencies that post-Brexit Britain will be free to share with its friends, whether they are located in Europe or the Middle East.

British renewable energy companies have excelled in the scaling of industrial solar PV and storage solutions. If they can work with Saudi Arabia to grow their renewable energy capacities, they can make a world-changing impact on global warming and climate change. And as a bonus, they can support Britain's most important friend in the Arab world and revitalise post-Brexit Britain's economy.

Indeed, the intersection between

what Saudi Arabia needs and what the UK can offer is very fortuitous. The leaders of both countries are seeking economic diversification – Theresa May to strengthen a diverse post-Brexit British economy and Prince Salman to realise his ambitious reforms.

It is ironic that some of the countries that have historically been most excited about solar power have had the coldest weather: Germany, the UK,

Denmark. Saudi Arabia's sun is as plentiful as its oil – and unlike fossil fuels, it is not going anywhere.

*Vicente Lopez Ibor Mayor is Co-Founder of Lightsource BP and Chairman of the Lightsource Foundation. He is also Chairman of solar storage company Ampere and is former Director of Spain's National Energy Commission.*



**Lopez-Ibor Mayor: Saudi Arabia's sun is as plentiful as its oil**

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## 10 | Tenders, Bids & Contracts

### Americas

#### ABB wins Capital Grid order

ABB has won an order to supply gas insulated switchgear for the Capital Grid project, an initiative aimed at strengthening the electric network in US capital, Washington DC.

Washington DC is experiencing its highest population growth in four decades, fuelling an increased demand for reliable electricity. The Capital Grid project was initiated to replace aging grid infrastructure and increase transmission capacity in the District of Columbia and Maryland, to address current and future energy needs.

The upgrade will also help build grid resilience to withstand and recover from unforeseen events such as severe storms.

As part of the order, ABB will design, supply and install 69 kV and 230 kV GIS for four substations within the network.

#### Ingeteam wins control centre contract

Ingeteam, an independent global supplier of electrical conversion and turbine control equipment, announced that it has been awarded a substantial contract by leading Mexican renewable energy developer Zuma Energia to provide a state-of-the-art control centre for its operational wind farm in Oaxaca, Mexico.

The control centre will be the cornerstone of Zuma's asset performance management, allowing it to gather and analyse a vast array of essential operating data, not only on the wind turbines and substations, but also on the electricity market and the variations of meteorological conditions.

### Asia-Pacific

#### Toshiba upgrades Bayswater

Toshiba International Corporation Pty. Ltd. has won a major contract to retrofit steam turbines and generators as part of an upgrade of Bayswater power station in Muswellbrook, Australia, from AGL Macquarie Pty Ltd, a subsidiary of Australia-based AGL Energy Ltd.

All of the key equipment for the project will be supplied by Toshiba Energy Systems and Solutions Corporation (Toshiba ESS), with delivery of the main components for the first unit scheduled for early 2019. Site work is planned to follow, in line with AGL's major maintenance programme and subject to regulatory approvals.

The upgrade project will improve Bayswater power station's output and efficiency and will provide an additional 100 MW of much needed output to the grid, without any increase in coal consumption or emissions.

#### BHEL to build supercritical plants

Bharat Heavy Electricals Limited (BHEL) has won an Rs117 billion (\$1.79 billion) contract to build three 800 MW supercritical thermal power plants in Jharkhand, eastern India.

The construction of three power plants is part of the phase-I of Patratu Super Thermal power station expansion plan. They will be built by BHEL at Patratu in Ramgarh district of Jharkhand, on an engineering, procurement and construction (EPC) basis.

The project was awarded to BHEL by Patratu Vidyut Utpadan Nigam

(PVUNL) through an international competitive bidding (ICB) process.

PVUNL is a joint venture between the National Thermal Power Corporation (NTPC) and Jharkhand government-owned power company Jharkhand Bijli Vitran Nigam.

#### Wärtsilä signs Bangladesh deal

Wärtsilä has signed a contract to deliver the equipment for a new 105 MW power plant in Bangladesh.

The plant will feature six Wärtsilä 50 engines running on heavy fuel oil (HFO) and will be built by Baraka Shikalbaha Power Ltd. It will be located near the Karnaphuli river in Shikalbaha, Chittagong, in southeastern Bangladesh.

The new plant is part of Bangladesh's efforts to increase access to electricity and support economic growth.

#### Siemens secures Pakistan contract

Siemens has signed a long-term service agreement with Punjab Thermal Power (Private) Limited to provide comprehensive maintenance, parts and repair services for Punjab Power Plant Jhang for the next 12 years.

Located in Haveli Bahadur Shah, Punjab Power Plant Jhang, is expected to add 1.3 GW to Pakistan's grid, making it one of the largest gas fired, combined cycle power plants in the country. It will also see the first deployment of Siemens' SGT5-8000H gas turbines in the country.

The agreement covers all the scheduled and un-scheduled outage services for two SGT5-8000H gas turbines, generators, related auxiliaries as well as the supply of spare parts and field services.

#### Suzlon bags Maharashtra order

Suzlon has received an order for the development of a 75 MW wind energy project from an independent power producer (IPP) in India.

The IPP won the license to build the wind farm in a tender held by the Maharashtra State Electricity Distribution Company Ltd (MSEDCL). Suzlon will install around 36 units of S111-140M wind turbine generators with rated capacity of 2.1 MW each. The project will be located in Maharashtra and will be commissioned as per MSEDCL bid guidelines, Suzlon said in a regulatory filing.

Suzlon said it will execute the entire project on a turnkey basis and will also provide comprehensive operation and maintenance services for the complete project lifecycle.

#### BHEL wins nuclear order

State-run power equipment maker BHEL today said that it has bagged an order from Nuclear Power Corporation of India Ltd (NPCIL) for the supply of steam generators to a plant at Gorakhpur in Fatehabad district of Haryana.

The steam generators will be used for a 700 MWe pressurised heavy water reactor (PHWR) to be installed in Haryana. BHEL won the order in a competitive bid process.

### Europe

#### SGRE supports Ardoch and Over Enoch

Siemens Gamesa Renewable Energy (SGRE) has signed a new contract with renewable energy company, NTR plc, to extend the service and maintenance of the Ardoch and Over Enoch wind farm in Scotland for another ten years until 2034.

At present, SGRE maintains the five turbines on the site, located in East Renfrewshire, as part of a 10-year contract awarded when the wind farm first became operational in 2014. The turbines are SWT-2.3-93 units with a maximum tip height of 110 m.

#### Valmet signs CNIM frame agreement

Valmet has signed a frame agreement with CNIM to supply its distributed control system (DCS) to all waste-to-energy (WtE) and biomass-to-energy (BtE) new builds and retrofits awarded to CNIM in 2017 and 2018.

The agreement builds on the two companies' existing partnership, which has seen them partner on the construction of 21 WtE and BtE plants. It will also enable CNIM to handle the increased workload of its expansion into new markets.

#### Stena places Vestas order

Stena Renewable AB has placed an order with Vestas for 72 MW for two projects in southern Sweden.

Vestas will deliver 16 V136-3.45 MW turbines with 3.6 MW Power Optimised Mode specifically increased to 3.8 MW for the Kronoberg wind power project, and 3 V136-3.45 MW turbines in 3.6 MW Power Optimised Mode for the Fjällberget wind project.

The V136-3.45 MW's different power modes and the full use of permitted total heights will help to ensure a high capacity factor and maximise energy production at both sites based on the specific wind conditions.

The contract includes supply, installation and commissioning of the wind turbines, as well as a 25-year Active Output Management 5000 service agreement. Delivery of the wind turbines is expected to begin in the second quarter of 2019, while commissioning is expected in the third quarter of 2019.

#### Germany launches wind auction

The German Federal Network Agency (BNA) has launched the second tender of the year for onshore wind power projects with a bidding deadline set for 1 May 2018.

The tender amount has been set at 670 MW and a maximum price for the bids set at 6.3c/kWh. Some 222 MW of capacity has been set aside for the so-called 'network expansion area', which comprises major parts of north Germany.

In February 2018, the BNA awarded 709 MW of grid capacity to 83 onshore wind projects at an average support price of 4.7c/kWh. Successful bids ranged from 3.8c/kWh to 5.3c/kWh.

#### EDF awards training contract

EDF Energy has awarded Babcock a contract to deliver a Managed Training Service for its Hinkley Point C nuclear energy project.

The contract is a 10-year agreement. Babcock will deliver the service through its Learning Management System, which allows employees to manage their own learning and compliance through a dedicated portal. The service also includes training management and administration services, and a wide range of training and other learning services to assure the competency of the workforce and support their development.

The service will support EDF Energy in meeting its Nuclear Site Licence conditions.

#### Capstone supplies UK facility

Capstone Turbine Corporation has received an order for a C200S integrated combined heat and power (iCHP) microturbine for a commercial facility in the United Kingdom.

The order was placed under Capstone's new "Sell-to-Win" bundled solutions programme and includes a Capstone supplied integrated roof mounted heat recovery module (HRM) and a prepaid 5-year factory protection plan (FPP). Pure World Energy, Capstone's distributor for the United Kingdom, secured the order.

The iCHP will be installed at a commercial facility and will operate on natural gas.

#### Rolls-Royce seals Hinkley deal

Rolls-Royce has signed a contract with EDF Energy to provide heat exchangers for nuclear island systems at the Hinkley Point C nuclear power station in the UK.

Rolls-Royce was selected by EDF in 2016 as preferred bidder for the heat exchangers, along with the primary, liquid and gaseous waste treatment systems and ultimate diesel generators.

Hinkley Point C will be the first nuclear power plant to be built in the UK for decades and is one of Europe's biggest construction sites. It is due to come on line in 2025.

### International

#### Oman awards CCGT contract

An engineering, procurement and construction (EPC) contract estimated to be worth \$45.77 million has been awarded for the construction of Oman's Haima West combined cycle power plant, according to regional media reports.

The project will be located in Muscat and will be developed by Petroleum Development Oman (PDO), with construction expected to start in May.

The entire project is expected to be complete by the third quarter of 2021 at an overall investment of \$55 million.

#### Russia plans wind tender

Russia will launch a renewable energy tender in late May or early June 2018, according to the Russian Association of Wind Power Industry (RAWI).

The tender will be for projects to be delivered in 2019-2023 and will be carried out in two phases. The first phase will run between 29 May and 4 June, while the second phase will run from 5 June to 9 June 2018. The winners will be awarded 15-year capacity supply agreements.

The auction will include 830 MW of wind power capacity, 150 MW of solar PV capacity and 270 MW of mini-hydropower projects.

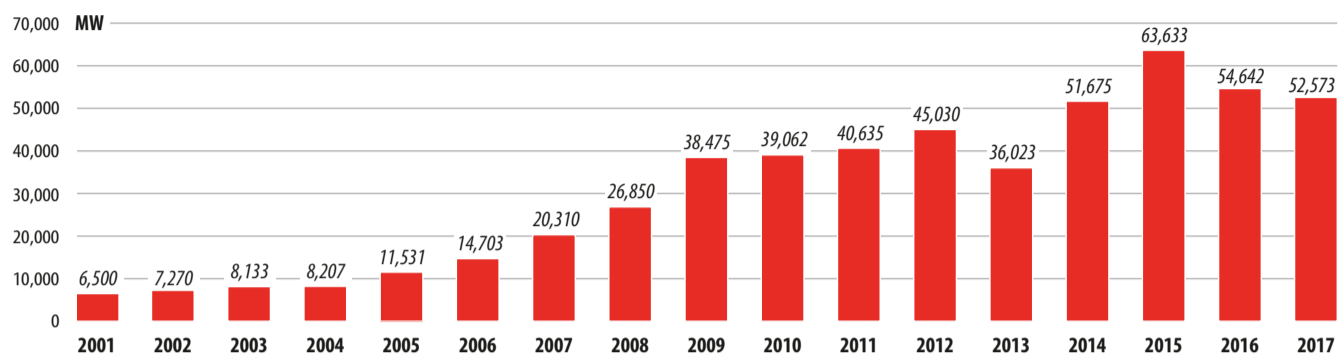
#### Siemens provides O&M for Sudan

Siemens has signed a long-term agreement with the Sudanese Thermal Power Generating Company (STPGC) to provide service and maintenance for the power generating assets and related components operating at the 337 MW Port Sudan and 502 MW Garri power plants.

Siemens will also provide operation and maintenance (O&M) advisory services for both plants. The agreement includes Siemens' Power Diagnostics, as well as support from Siemens' 24/7 Remote Expert Centre monitoring the controls systems. Using advanced data-driven analytics.

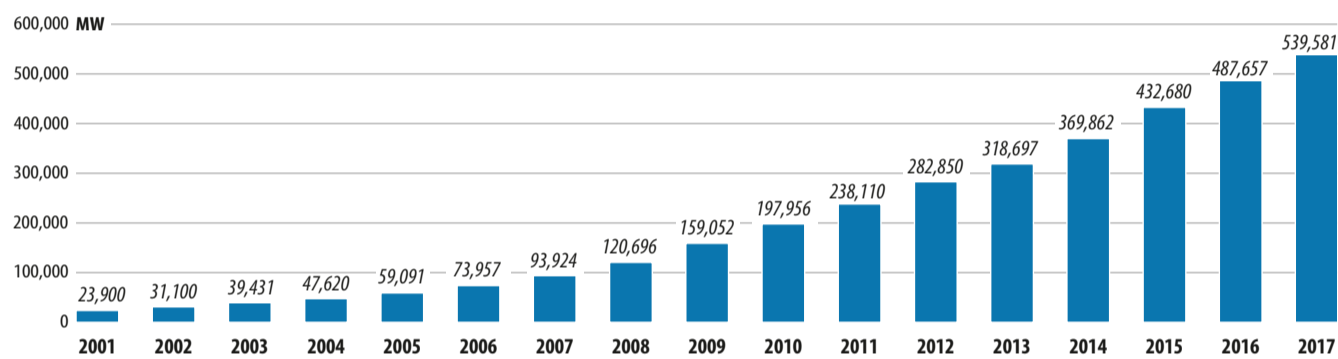


GLOBAL ANNUAL INSTALLED WIND CAPACITY 2001-2017



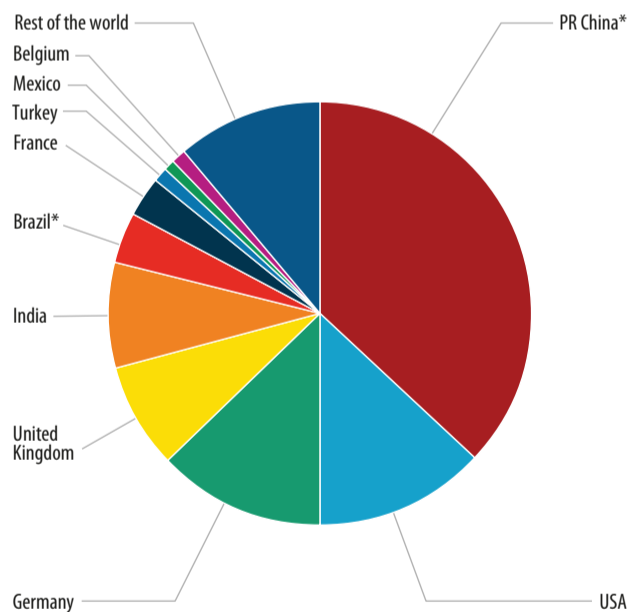
Source: GWEC

GLOBAL CUMULATIVE INSTALLED WIND CAPACITY 2001-2017



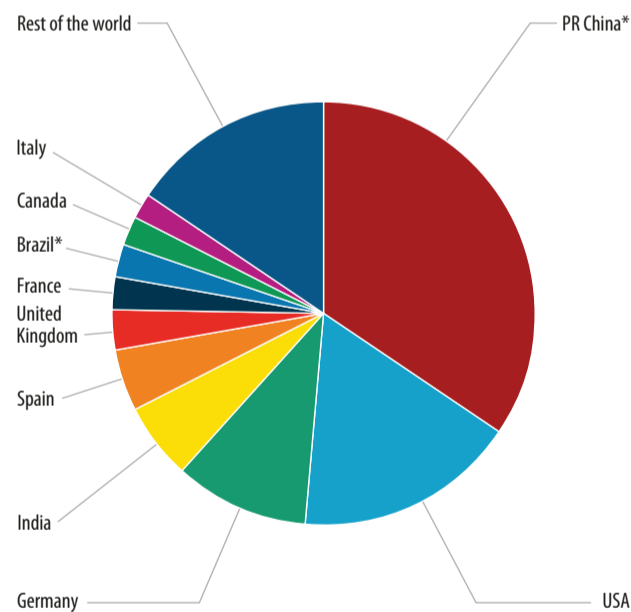
Source: GWEC

TOP 10 NEW INSTALLED CAPACITY JAN-DEC 2017



Source: GWEC

TOP 10 CUMULATIVE CAPACITY DEC 2017



Source: GWEC

\* Provisional Number  
 \*\* The stats include a decommissioning of 648 MW

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## Oil

# Oil market coming back into balance

- Market will re-balance during second and third quarters
- Venezuela's declining production and geopolitics remain a worry

David Gregory

A consensus was forming in late March that the oil market is coming back into balance. Opec and its non-Opec partners reported that compliance with the production cuts imposed by the two groups in January 2017 hit an all-time high in February, achieving 138 per cent of the 1.8 million b/d reduction target.

"Market re-balancing is clearly moving ahead with key indicators – supply and demand becoming more closely aligned, OECD stocks falling close to average levels, the forward price curve in backwardation at prices that increasingly appear to be sustainable – pointing in that direction," the International Energy Agency (IEA) said in the March *Oil Market* report.

The Paris-based agency said it expected that Opec production would remain flat for the rest of 2018 and due to this there would be a very small stock build during the first quarter of

2018 with deficits in the rest of the year. It added that Venezuela's vulnerable oil industry, which is facing production decline due to its economic crisis, could be the final element that "tips the market decisively into deficit," the IEA said.

Opec is forecasting that all will be right sometime during the second and third quarters of this year, but the production cut is due to last until the end of the year, although there are no agreed steps on how the participants will return to their pre-cut production levels. The joint Opec and non-Opec committee is due to meet in April to review the situation.

The price of international marker Brent crude has remained in the \$60-\$70/b range since the start of the year and has been sustained by the usual worries that pester the oil market. Interruptions in Libya's oil production due to the continuing war there and unsteady output from Nigeria have helped hold oil prices aloft.

Venezuela's declining production,

which is now below 2 million b/d, is also a worry, as is the geopolitics of current relations between Iran and the US, whose President, Donald Trump, continues to threaten to leave the Iran nuclear deal, arguing the conditions against Iran aren't strong enough. Should the US pull out of the treaty and attempt to re-impose sanctions against Iran's oil industry, the market could see a drop in Iranian supply and a spike in prices.

Saudi Arabia's Crown Prince Mohammed bin Salman met with President Trump in late March and told him that Riyadh sees the oil market coming back into balance this year. Saudi Arabia also supports Trump in his opposition to the Iran nuclear deal, seeing Iran as its main rival in the Middle East, and has warned Iran that if it pursues a course to acquire nuclear weapons Saudi Arabia would do the same.

During the last year, Saudi Arabia's consideration to sell shares in national oil company Saudi Aramco has drawn

considerable attention, but it may now be the case that Riyadh will forego the idea. It has been difficult to arrive at a valuation of Aramco, and there has been considerable thought given on where to list the company. Aramco wants to put the value of the company at \$2 trillion, but experts think an oil price of \$80/b will be necessary before the value of the company can be put at that price. Saudi officials have said that it is unlikely that the planned initial public offering (IPO) will take place this year.

While there may be interruptions to oil production amongst Opec members such as Libya, Nigeria, Venezuela and maybe Iran (which is working to boost output to 4 million b/d), crude production in the US, Canada and Brazil are expected to increase in output.

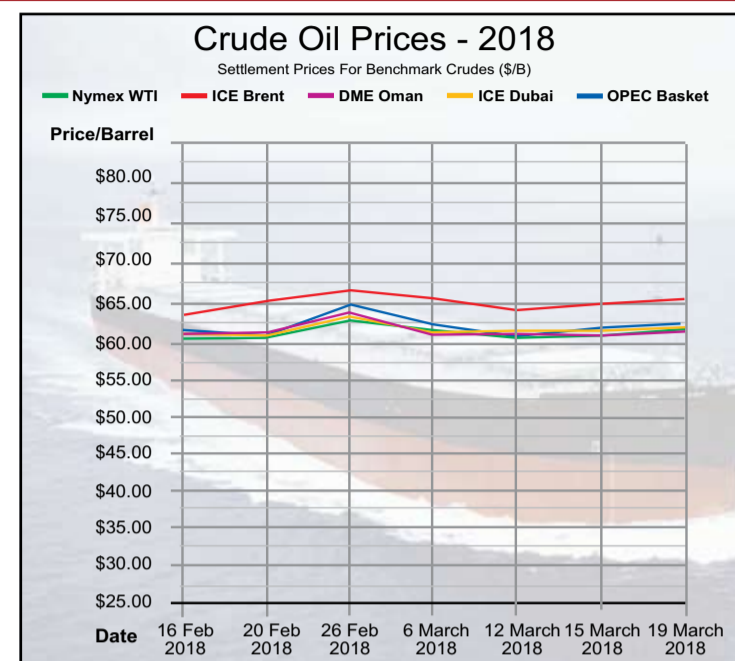
The US Energy Information Administration (EIA) reported in the March issue of its *Short-Term Energy Outlook* that US crude oil production averaged 10.3 million b/d in February

this year, up by 230 000 b/d from January. Total US crude production averaged 9.3 million b/d in 2017 and ended the year with production at 9.9 million b/d in December.

The EIA projects the US output will average 10.7 million b/d in 2018, the highest annual average for the US since 9.6 million b/d in 1970. The administration forecasts that US production will average 11.3 million b/d in 2019.

Global inventories declined by 600 000 b/d during 2017, according to EIA accounts. It forecast that global inventories would grow by 400 000 b/d in 2018 and by a further 300 000 b/d in 2019.

Analysts point out that foreign refiners are developing an appetite for West Texas Intermediate (WTI), which usually sells for several dollars less than Brent on global markets. With US crude relatively new to global markets it could be that its real impact has yet to be felt.



## Gas

## Future of BRUA gas pipeline in question

Naysayers doubt the future of the Bulgaria-Romania-Hungary-Austria (BRUA) gas pipeline as Hungary questions the economic viability of extending its portion of the pipeline to Austria.

Mark Goetz

The future of the Bulgaria-Romania-Hungary-Austria (BRUA) gas pipeline is being increasingly questioned, as it appears that Hungary is no longer committed to extending the European Union-backed project into Austria, where it would connect with the Central European Hub at Baumgarten.

The 1381 km pipeline has the support of the European Commission and is designed to connect the national gas networks of those four countries for the purpose of increasing energy security in Eastern Europe and enabling the region to reduce its dependence on Russia for natural gas supplies.

At the heart of the project is the intention to provide Romania with an outlet for its future gas production. OMV Petrom, a subsidiary of OMV, and ExxonMobil are partnered in Romania's Black Sea offshore Neptun gas field, which is expected to start producing 6 billion cubic metres (bcm) annually by 2021, boosting Romania's gas production to around 18 bcm/

year and more if other gas projects come on-stream by then. That volume of annual production will exceed Romania's domestic demand, making 4-5 bcm/year available for export in the early 2020s.

For OMV Petrom and ExxonMobil, getting the gas to Baumgarten could be one way to monetize their production. Other markets exist for them, possibly Moldova, Slovenia, Bulgaria, or even Ukraine or Turkey, but routing the gas to Baumgarten would be the way to other markets in Central and Western Europe.

However, last summer Hungary said it did not see the economic viability of extending its portion of BRUA to the Austria border, suggesting that it saw better market opportunities in sending the gas to Slovenia or Ukraine. This has led some to think that Hungary is thinking to discard its role as a transit state and establish itself as a regional hub. Late last year all the partners in BRUA agreed to continue with the project as originally planned, but then it was reported that two Hungarian

companies have won the auction for the entire 4.4 bcm/year capacity reservation for the gas pipeline connecting Romania and Hungary.

Upset with this announcement, some analysts have since said it appears that Hungary has a strategy to buy up all the natural gas exported by Romania through BRUA and use it first to fulfil its own gas demand and then re-export the rest to markets of its choice. They argue that this would not be in the interest of Romania, which would lose access to customers working through Baumgarten, nor would it be in the interest of Austria, which would lose access to Romanian gas supplies.

For its part, Romanian gas transport company Transgaz said last month that it is committed to BRUA and rejects accusations that it favoured Hungary in the capacity reservation tender.

"BRUA is a project of national interest, supported firmly by the European Commission," Transgaz said in a statement. "BRUA will bring to the country important income from tariffs of natural gas transport and will

change Romania into a serious player on the market of natural gas of the European Union. Transgaz keeps to its commitments according to the initial project, which benefitted from the support of all Romanian governments and rejects the accusations that they favour Hungary," the statement said.

Transgaz said that the reservation of transport capacity was necessary to start investment in Phase 2 of the project and that it had been in touch with the European Commission throughout the tendering process. It added that it had no control over the gas that will be extracted from the Black Sea, as its role is that of operator of the transport system with no right to trade in natural gas.

Romania has received considerable financial support towards the completion of its Phase 1 section of BRUA. In early February, the European Bank for Reconstruction and Development (EBRD) provided Transgaz with €60 million towards construction costs that will total €479 million. The European Commission has supplied a

grant of €180 million and the European Investment Bank (EIB) has contributed a loan of €50 million. Transgaz will itself invest \$149 million. Construction is to begin this year and Phase 1 is to be complete in 2019 and Phase 2 in 2022.

As strategic entities, oil and gas pipelines carry a political dynamic, but by the mid-2020s, there is a strong chance that an expanded gas pipeline and delivery system will exist in Eastern Europe. With Russia fighting to maintain its share of the European market, Russian gas will continue to be a key element in the region's energy, as it is the only gas supplier with relatively easy access to Europe.

But other projects, such as plans by Slovenia and Poland to link their gas systems, other interconnectors such as the Southern Gas Corridor and the Trans Adriatic Pipeline (TAP), plus new and planned LNG delivery terminals in the north and south will provide the European Union with greater energy diversity and security, provided those plans are carried out.



# Solving the big energy challenges with AI

The energy industry bears a unique responsibility for embracing the benefits of Artificial Intelligence and ensuring it can solve many of the world's challenges. But although the sector leads AI adoption, more work is needed, says **Suraj Ramaprasad**.

In a tempestuous 2017, there was little room for good news stories. In December, however, the National Grid announced a welcome piece of positive news, revealing that the year just ending had been the "greenest ever", with the UK setting as many as 13 new renewable records.

These included the most electricity produced from solar power at any one moment, and the most wind-derived energy produced in a single day. Even more noteworthy, 2017 saw the first full day since the Industrial Revolution without coal power.

The energy sector is undergoing fundamental and wide-reaching change, arguably greater than any before in its history. The revolution is being driven as much by new technology as it is by resource availability, costs and carbon legislation. The advent of automation, artificial intelligence (AI) and the Internet of Things (IoT) is providing the foundation for the urgent changes we must make in energy strategy, infrastructure investment, and even the way in which we distribute and consume energy.

Unlike other areas of industry, technological advances in the energy sector have a direct and tangible effect on us all. This includes controlling or bringing down the price of power at the meter, ensuring that we can charge a new generation of electric vehicles, or simply keeping the lights on in homes and businesses across the country. The energy industry therefore bears a unique responsibility for embracing the benefits of AI and ensuring it can solve the challenges facing people, economies – and the planet.

But although energy leads AI adoption more work is needed. In many industries, AI is little more than a plaything: an interesting diversion from the everyday business operations, promising vague benefits in the future. In the energy sector, it has already become an absolute necessity.

It is small wonder that the global

energy industry is well ahead of the curve in the adoption and application of AI. Infosys' polled respondents from ten industries and found that nearly half (48 per cent) of respondents from the energy, oil, gas and utilities sectors say that AI is fundamental to their organisations' success. Meanwhile a similar proportion (46 per cent) say they are "building AI into the company ethos".

Already, around a third of industry executives say that they have fully and successfully deployed AI technologies, compared to an average of 25 per cent across other sectors surveyed.

While the energy sector is leading the way in AI, full adoption is still far behind that required to support

the UK experienced the highest ever recorded output in renewable energy, reaching over 19 GW, while renewables contributed around 30 per cent of the country's electricity. As we know, perhaps the biggest drawback of renewables is their intermittency, and until battery technology has advanced sufficiently to support region-wide energy storage, smart grids will play the main role in distributing power.

Artificial intelligence is crucial for balancing energy production and output in real-time. Indeed, the UK's National Grid last year began exploring a potential partnership with Google to deploy DeepMind to predict demand patterns, and help maximise the use of renewables through

**The UK's National Grid last year began exploring a potential partnership with Google to deploy DeepMind to predict demand patterns, and help maximise the use of renewables**

much needed developments in a range of fields, from smart grids to energy efficiency, infrastructure management to customer service. The benefits are, however, well understood, with the industry citing process IT and business process automation, and increased innovation as the key drivers. The industry's next goal must be to put AI at the very heart of its business strategy.

The most obvious large-scale application of AI is in mastering the huge volumes of data produced by smart grids, and using this insight to optimise power generation and distribution across these complex networks.

With connected devices embedded from power stations to home energy meters, AI is essential for analysing the real-time information that they produce and deciding how to allocate energy resources appropriately.

This is especially important given the increasing importance of renewables in our energy mix. In March

machine learning that can predict peaks and troughs in demand, and match them to the available supply.

The same technology can also monitor grid efficiency, analysing the flow of energy across networks and therefore helping to avoid outages or "brownouts". Artificial intelligence is also critical for optimising energy storage, with General Electric predicting that it will save \$200 billion a year by improving grid efficiency.

Siemens, meanwhile, is using AI to change fuel distribution in turbine burners to improve their efficiency. It's not just in energy generation, either: AI is also making homes energy efficient. One Californian startup, Bidgely, is just one example of a firm using machine learning algorithms to analyse the energy consumed by domestic appliances. Bidgely produces detailed insights to tell consumers how they are using energy and where they can save.

There are also important AI applications in the area of operation

maintenance. Tokyo Electric Power Company, Japan's largest utilities provider, is commissioning a predictive maintenance pilot that will use weather, sensor and temperature data among others to detect and prevent costly failures of its infrastructure. Even shareholders, then, have a significant stake in the success of the AI revolution.

And let's not forget the customer. Alongside the critical improvements to energy distribution and grid management, perhaps the most exciting and immediately relevant application of AI is in improving relationships with customers.

It's fair to say that energy and utilities companies do not enjoy the best reputation among UK service providers, being accused of opaque, overly-complex tariffs that prevent customers from getting the best deals.

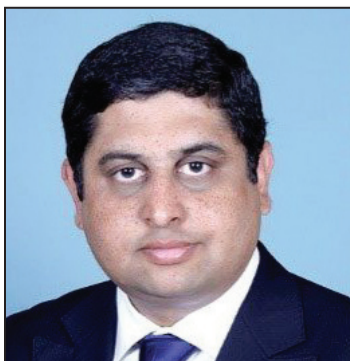
Interestingly, although current AI deployments are mainly focused on improving production and distribution operations, a massive four-fifths (81 per cent) of our respondents say they believe AI will have the greatest impact in business-to-customer engagement.

Energy and utility firms therefore have a fantastic opportunity to harness AI to improve the way they communicate with their business and residential customers. This could involve helping them choose the right tariffs, creating bespoke energy-saving recommendations, automating the process of moving suppliers, or better resolution of customer service enquiries or complaints – for example, through automated chatbots.

In a recent press release, the National Grid looked forward to even more good news on renewables in 2018. If the energy industry can wholeheartedly embrace the potential of artificial intelligence, it too can expect to see a more efficient, more profitable future.

*Suraj Ramaprasad is Partner and Europe Head of Energy & Utilities Practice, Infosys Consulting.*

**Ramaprasad: The industry's next goal must be to put AI at the very heart of its business strategy**



# The ability to cooperate intelligently

Generating asset owners are serious about driving performance. Data analytics and closer cooperation with digital solutions providers are key tools in this drive.

**Junior Isles reports from Genoa, Italy, at the recent opening of ABB's first Collaborative Operations Centre dedicated to power and water.**

**D**igitalisation is cutting across many sectors. And, arguably, the electricity sector is at the heart of the digital transformation. In its report on the interplay between digitalisation and energy, the International Energy Agency (IEA) said: "Energy and digitalisation intersect in many ways. Many of the energy companies we speak to are increasing their investment in digital technologies. Our numbers show that the investment in digital electricity infrastructure has increased by 20 per cent each year over the past couple of years."

It is a view that was recently echoed by Kevin Kosisko, Managing Director, ABB Power Generation & Water. Speaking at the launch of the company's new ABB Ability Collaborative Operation Centre (COC) in Genoa, Italy – the first such centre dedicated to its power and water business – Kosisko said: "There are numerous studies around how much digitalisation is going to bring in total value to the sector... it is getting a lot of traction with our customers right now, who clearly see the value. Whenever I meet with them, I can't recall a single meeting in the past 12 months where, at some point, we don't talk about what we could do with digital and data analytics to help them solve some of their most pressing challenges."

There is no doubt that utilities and other generating asset owners are serious about driving performance. Certainly the savings can be huge. A report released by the World Economic Forum in 2016 talks about unlocking €1.1 trillion of opportunity within the energy industry in the next 10 years.

## Swedish solutions

ABB Ability, launched nearly one and a half years ago, is the technology component of ABB's Collaborative Operations centre. It is a unified, cross-industry digital platform that enables ABB to securely integrate and aggregate data, apply predictive analytic and generate insights that can help drive profitability for ABB's customers.

ABB says Ability is not simply a platform, but is a "solution-driven approach" to the market. Some 200-odd solutions have already been developed on the platform. "Over the past 14 months or so, we've launched about 210 ABB Ability solutions," said Kevin Kosisko, Managing Director, ABB Power Generation & Water. "There are solutions built not only on our platform, but built from the various pieces of software and systems that we have, in order to drive value for our customers."

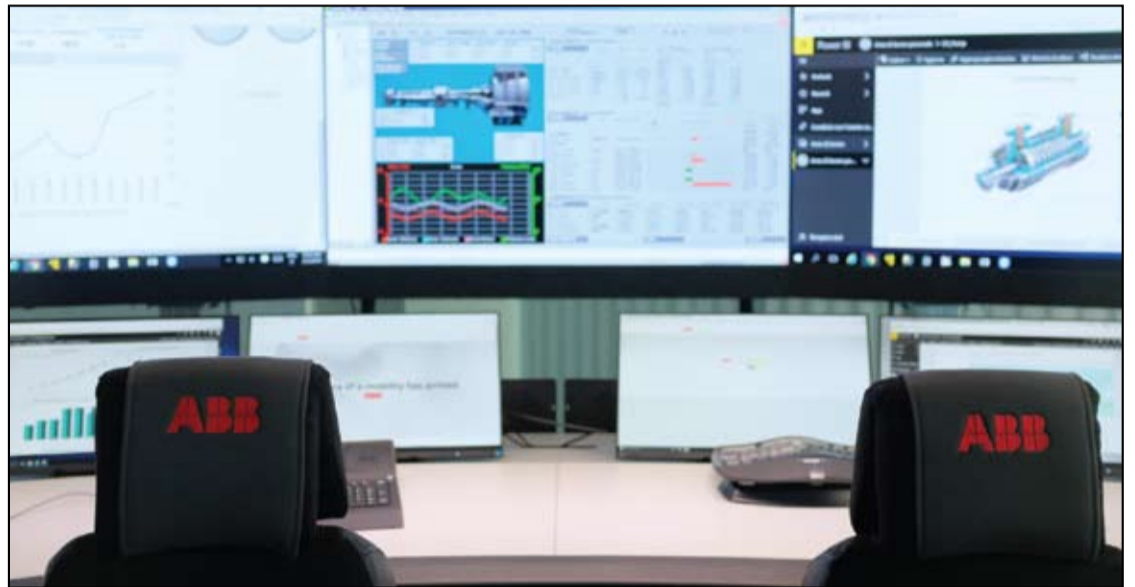
In February ABB signed a contract with Swedish energy company, Mälarenergi to develop "smart city solutions" that will make Västerås, Sweden's fifth largest urban area, more attractive as a community for citizens and industry.

Mälarenergi provides a range of essential services for Västerås' 150 000 residents and businesses. The utility operates hydropower plants, the local power grid, a waste-to-energy plant, heating and cooling networks, water and wastewater treatment plants, a water distribution network and a fibre-optic network.

In 2017, Mälarenergi and ABB formed a team to develop digital solutions that will minimise environmental impact and create high-value digital services for customers. A key objective of this digital investment is to integrate the control rooms of the many automation systems that manage these expansive operations to create one unified operating environment.

This "smart city solution" will leverage the ABB Ability Collaborative Operations approach to integrating ABB technologies and services with Mälarenergi's existing operational expertise. Collaborative Operations will combine deep control and domain knowledge of both parties, to make more useful information available faster. This approach will transform Mälarenergi from a traditional utility infrastructure company to a provider of integrated "infra-services" with the end-user experience in mind.

Applied to the district heating network, for example, which serves 98 per cent of the city's buildings, Collaborative Operations will optimise operational performance and reduce energy consumption. Data analytics will make it easier for operators to identify, categorise and prioritise potential issues with assets, processes and risk areas, so they can increase efficiency and reduce costs.



Extended operator workplace at the ABB Ability Collaborative Operation Centre, Genoa, Italy

There are a couple of key areas where digitalisation is having a significant impact – predictive maintenance to reduce operation and maintenance costs or extend power plant lifetime is one; the other is fleet optimisation. According to industry calculations, 50 per cent of that €1.1 trillion could be achieved by reducing unplanned outages – it has been estimated that more than 75 per cent of unplanned outages can be predicted through digitalisation and better data analytics.

A more recent report by Bloomberg New Energy Finance (BNEF) said that, currently, the biggest use of digital technologies like sensors, data collection and analytics in the energy sector is to improve the bottom line of fossil fuel generators. Revenue for digital services for fossil fuel operation and maintenance (O&M) are estimated to be \$24 billion in 2017 – some 44 per cent of the

total market size for digitalisation measured by BNEF.

Kosisko notes that while ABB, like others, has been doing remote diagnostics and troubleshooting for many years, the introduction of platforms like ABB Ability brings an opportunity to "take it to the next level" in terms of collaborating with customers in real-time in order to deliver value. This is the crux of the thinking behind the new COC in Genoa.

ABB Ability Collaborative Operations is a remote operations and maintenance model that helps power generation and water companies harness the potential of digitalisation.

Through a high-speed, cyber-secure connection to the plant's distributed control system, the centre continuously monitors key performance indicators (KPIs) across a comprehensive suite of applications to ensure that each plant is operating within regulatory, load, environmental and cyber security requirements, automatically notifying the customer if a KPI is underperforming or a reference limit is broken.

"Traditionally, digital projects tend to start with a vendor having a specific proposal around solutions that they have... and implementing a project," said Kosisko.

"Collaborative Operations gives us more of a real-time opportunity. When you have this 24/7 real-time connection ability to not only diagnose issues, but to also monitor data around unit performance, device performance, fleet performance and collaborate with customers in real-time, these are the areas where we can find opportunities to improve operations – improve maintenance, reduce downtime, improve availability. They aren't specific one-time projects, but real-time collaborations."

At the newly opened Genoa facility, ABB demonstrated a scenario where it was able to view a customer site from the centre and with the help of augmented reality and data analytics was able to get the equipment back on line in the quickest and safest way possible. In another scenario, ABB showed how it could look at the performance of specific pieces of equipment or entire units and identify the need for maintenance to avoid an unplanned outage.

In the final demonstration, the company compared the performance of operating units against each other to determine how improvements could be made on the under-performing units.

Kosisko stresses that today's plant owners are serious about driving performance. "Many of our customers have actually started to mention this in their quarterly report to the market, identifying that they see the potential for a 15-20 per cent improvement in overall operational performance, [through] reduction in maintenance costs, improvement in output and yield. They are publicly stating this to the investment community."

Driving operational performance is becoming an increasingly important topic worldwide. Different countries may be at different levels of adopting this kind of technology but the trend is global.

"We see very high interest in Europe and North America, and strong interest in Asia," said Kosisko. "But I was in the Middle East recently and had several conversations, which all led back to digital. So it's pretty universal." In line with this trend, ABB plans to open two more COCs for power and water in Singapore and Mannheim, Germany, this year.

Arguably, the industry is still at the beginning of what can be achieved through greater digitalisation and data analytics but the possibilities are huge.

"It's always a bit hard looking into the future because there's so much potential right now. We're just really scratching the surface with what's available to us and the solutions that we can provide," said Kosisko. "But certainly when you go down the path of things like machine learning and AI, you can envisage scenarios where you get more autonomous operations as we move forward."

While we may not see things like operator-free plants in the near future, Kosisko does expect that operators, field technicians, managers and those responsible for delivering results, will be in a position to augment their decisions with better data, which has been packaged in a way that helps them understand how processes are behaving.

Going forward, data analytics will increasingly be applied in different ways – and not just for operating assets. It will also be used to improve projects from the outset by feeding data from existing projects back into the modelling and design phase.

Kosisko concluded: "We are in the early stages of what is going to be a transformational trend... and as we move forward, it is going to become a bigger and bigger part of our business and our customers' value."

# The crypto-kilowatt

A new energy start-up hopes to address the issue of rising energy consumption in the cryptocurrency sector – by building power plants for its own coin mining operations.

**Siân Crampsie**

Cryptocurrencies may be the new buzzword in some tech circles, but in the energy sector the growth of the digital coins is raising concerns.

Ahead of the March 2018 G20 Summit in Argentina, Bank of England Governor Mark Carney criticised the “speculative mania” surrounding cryptocurrencies such as Bitcoin and the associated costs and energy consumption of digital coin mining.

“The costs of Bitcoin mining are enormous,” said Carney. “Its current annual electricity consumption is estimated by some to be up to 52 TWh, double the electricity consumption of Scotland.”

His comments led UK grid firm National Grid to say that while it is monitoring the growth of cryptocurrencies and the energy consumption associated with their mining, it has so far had little impact on UK electricity demand. Other countries, where electricity costs are lower, are seeing more of an impact, according to David Merry, CEO of Investoo Group.

“Crypto mining is huge in Iceland and in countries like China it is fast becoming a tool to make money for those able to do so,” noted Merry.

The current value of all cryptocurrencies is estimated to be around \$100 billion, according to HowMuch.net, and the growth in the number of digital coin schemes and their value has sparked concerns about a speculative bubble. There are no signs that the market is slowing, however, and how continued growth in coin mining will impact energy consumption.

Digital coins and energy consumption have an indelible link: transactions involving digital currencies and blockchains have to be verified by ‘miners’ running specialised software. When transactions are verified, miners receive payment in cryptocurrencies; however, the computer processing power required to do this – and the associated energy consumption – is huge, and growing.

According to startup firm 4NEW, in September 2017, one Bitcoin

transaction used the same amount of electricity used by seven US homes in a day; by the end of 2017, this had risen to the equivalent of 10.5 homes, and by February 2018, to 27 US homes.

The market capitalisation of cryptocurrencies rose by 2000 per cent in 2017, and the energy consumption of Bitcoin mining surpassed the entire energy consumption of Bangladesh in early 2018, 4NEW says. In addition, the more valuable digital coins become, the more energy is required to mine them, leading to the possibility of energy price spikes.

The rate of this rise is alarming, has implications for the environment as well as the energy sector, and is also threatening the sustainability and evolution of the cryptocurrency sector, according to Saransh Sharma, President of 4NEW.

The firm has therefore come up with a novel solution: the creation of a ‘tokenized’ electricity system, linking waste-to-energy power plants and blockchains and underpinned by its own digital coin.

The solution proposed by 4NEW will help to solve two problems – the energy consumption associated with digital coin mining, and rising levels of waste produced by the world’s populations.

4NEW has already embarked on its innovative venture, with planning permission for two waste-to-energy plants in the UK. In 2017 it secured \$25 million of funding from Florida-based Mirach Capital and launched the Initial Coin Offering (ICO) of its digital currency – the KWatt. It is also in talks with other potential equity investors to help fund its venture, according to Sandeep Golechha, 4NEW CEO.

Golechha says that its first power plant will have a capacity of around 10 MW initially with one waste line but the firm is hoping to expand to two lines and 20 MW. With two plants operational, its portfolio will eventually reach 40 MW – enough to support around 5 per cent of global Bitcoin transactions. It has not yet finalised the technology for the plants, but is expecting to use a

pyrolysis technology, according to Golechha.

4NEW plans to source waste for its power plants locally, using waste aggregators from industries such as construction and medicine. The application of blockchains to this sector is a natural fit, Golechha said.

“The idea of using the blockchain element was to meet and ease all the complex regulatory requirements associated with the waste industry,” said Golechha. “All the licenses and records of waste movements can be kept on one specific contract for each specific movement, and then the payments for that can be also made within that.”

“Blockchains allow full transparency and more certainty for everyone. Every regulatory piece of compliance is checked and recorded, and could be accessed by regulators.”

4NEW’s initial idea was to supply energy produced by its plants to local populations, creating a true ‘circular economy’ blockchain model. Its business model has since evolved however, with the firm recognising the value of coin mining. It is therefore planning to build a cryptomining farm, powered by energy produced by its own plants.

4NEW launched the pre-sale round of its KWatt coin in late 2017, with the formal Initial Coin Offering (ICO) going live in January 2018. It has so far raised over \$40 million

from the coin offering, and was targeting close to \$75 million by the end of March 2018.

4NEW’s real innovation is to peg the output of its power plants to its coins, with each coin embedded with 1 kW of energy. Based on the planned output of its two plants, it has issued 300 million KWatt coins. Holders of these coins will be able to apply their energy to one of two places: they can either sell their energy to the UK National Grid, or they can choose to apply it towards 4NEW’s cryptocurrency mining farm.

Net revenues generated from energy sales to the cryptomining farm will be distributed in cryptocurrencies to coin holders annually. Net revenues generated from energy sales to the UK national grid will be retained for future plant construction, resulting in additional KWatt distributions for coin holders.

4NEW believes that its first-mover status as an energy company actively operating in the cryptocurrency space will be its competitive advantage. It plans to complete installation of its first power plant by mid-2018, and complete the blockchain platform integration and mining farm later in the year. Completion of the second waste to energy plant is scheduled for mid-2019. It is also looking at options for using the heat output of its mining farm.

## Digital coin basics

Digital currencies emerged in 2009 with the launch of Bitcoin, the coin that continues to dominate the cryptocurrency space. Digital currencies are created and stored electronically and are not issued or regulated by any one central authority. Many of them use cryptography for security so that they are difficult to counterfeit; however that has not made them completely invulnerable, with hackers reportedly stealing around \$15 billion-worth of Bitcoins over the life of the currency.

Cryptocurrencies are underpinned by secure peer-to-peer networks known as blockchains, which provide a digital ledger of transactions. So-called ‘miners’ verify these transactions are paid for their efforts in digital coins.

The website CoinMarketCap lists over 1000 different types of cryptocurrencies, with Bitcoin topping the list with a market capitalisation of over \$154 billion, followed by Ethereum at \$57 billion. There are almost 17 million Bitcoins in circulation, well below the 21 million cap specified by creator Satoshi Nakamoto.

Cryptocurrencies have been credited with the creation of millionaires as well as assisting new corporate ventures through Initial Coin Offerings (ICOs), but their rapid growth is giving governments, regulators and the established financial sector a headache: should cryptocurrencies be regulated and trusted, and how risky is exposure to digital coins?

Some central banks have gone as far as considering the creation of their own national cryptocurrencies, and there are now thought to be almost 100 companies worldwide that accept Bitcoins for payment.

More recently, companies in the energy sector have realised the potential value of blockchains, and have embarked on projects – often in conjunction with innovative start-ups – to test the application of blockchains in their businesses.

In October 2017, Enel and E.ON said they had traded electricity for the first time via a new marketplace that uses blockchain technology, while the Rocky Mountain Institute and Austrian blockchain developer Grid Singularity has signed up ten global energy companies to its Energy Web Foundation, an organisation devoted to accelerating the use of blockchain technology in the energy sector.

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

**The energy consumption of Bitcoin mining surpassed the entire energy consumption of Bangladesh in early 2018.**  
Data below (as of February 28, 2018) provided by Digiconomist Energy Consumption Index.  
<https://digiconomist.net>

| KEY NETWORK STATISTICS   | BITCOIN         | ETHEREUM        |
|--|-----------------|-----------------|
| Network's current estimated annual electricity consumption* (TWh)                                | 53.28           | 15.22           |
| Annualized global mining revenues  | \$9,394,837,576 | \$8,008,152,741 |
| Annualized estimated global mining costs   | \$2,664,009,403 | \$1,825,907,528 |
| Country closest to in terms of electricity consumption   | Bangladesh      | Syria           |
| Electricity consumed per transaction (KWh)   | 262             | 55              |
| Number of U.S. households that could be powered in a year  | 3,427,719       | 1,408,879       |
| Number of U.S. households powered for 1 day by the electricity consumed for a single transaction | 26.41           | 1.87            |
| Bitcoin's electricity consumption as a percentage of the world's electricity consumption         | 0.24%           | 0.07%           |
| Annual carbon footprint (kt of CO2)  | 26,107          | -               |
| Carbon footprint per transaction (kg of CO2)   | 382.9           | -               |

# A brief moment in time



Junior Isles

Renowned physicist Professor Stephen Hawking, was arguably one of the greatest minds of modern times and author of best-selling 'A Brief History of Time'. As an expert on space and time, I wonder what the late, great Professor would have had to say on the time 'lost' on European clocks due to a dispute between Serbia and Kosovo.

Professor Hawking once said to British Prime Minister Theresa May: "I deal with tough mathematical questions every day, but please don't ask me to help with Brexit." Indeed solving political problems often appears more complex than unravelling the

secrets of the universe.

In March, it was reported that a slowing in frequency from Europe's standard 50 Hz has caused electric clocks that keep time by the power system's frequency, rather than built-in quartz crystals, to fall behind by about six minutes since mid-January.

The Brussels-based European Network of Transmission System Operators for Electricity, or ENTSO-E, said the problem, which affects 25 countries, from Portugal to Poland and Greece to Germany has been caused by a loss of energy in the area of Kosovo and Serbia because of a political dispute between the two

countries, which first began almost 20 years ago.

The continental network had lost 113 GWh of energy since mid-January because Kosovo had been using more electricity than it generates. Serbia, which is responsible for balancing Kosovo's grid, had failed to perform that balancing, ENTSO-E said.

Serbia's power operator, EMS, blamed the problem on Kosovo, claiming that in January and February the country "was withdrawing, in an unauthorized manner, uncontracted electric energy from the continental Europe synchronous area".

Kadri Kadriu, deputy manager of Kosovo's grid operator, acknowledged that electricity from elsewhere was diverted to the Serb minority in the north, but said consumers there had not paid for their electricity, causing considerable financial burden to the company.

Claire Camus, a spokeswoman for ENTSO-E, commented: "This is beyond the technical world. Now, there needs to be an agreement between Serbia and Kosovo about this lack of energy in the Kosovo system. You need to solve it politically and then technically."

"Since the European system is interconnected... when there is an imbalance somewhere the frequency slightly drops," said Camus. The Brussels-based organisation added that "this average frequency deviation, that has never happened in any similar way in the Continental European power system, must cease".

In March, ENTSO-E said it was working on a technical solution that could bring the system back to normal within "a few weeks", but called on European authorities and national governments to address the political problem at the heart of the issue.

Shortly after, a German envoy visited Kosovo in an effort to resolve the dispute. Kosovo Prime Minister Ramush Haradinaj's office said that Klaus Toepfer, an ex-German environment minister sent as a mediator, visited Pristina. Haradinaj called on Serbia not to block a 2015 deal that was a major step toward normalising relations with Kosovo.

Reaching a lasting resolution, where both sides can move beyond the historical dispute, however, may be more difficult than time travel. No doubt it will not be too long before ENTSO-E comes up with a technical solution that will help shift Europe's citizens six minutes forward in time (and ensuring they stay in sync with the rest of the world) without them even noticing.

So having solved one of the science world's great mysteries on whether time travel is possible, perhaps the industry can now turn its attention to another of the scientific world's biggest questions: what is the final fate of the universe?

Professor Hawking and other physicists and cosmologists largely believe in the Big Bang theory with regards to the origins of the universe but there are several theories on its final fate. One theory is the 'Big Crunch'. This assumes the universe will stop expanding and begin contracting, ultimately with all the matter and space-time in the universe collapsing into a singularity back into how the universe started with the Big Bang. This scenario allows the Big Bang to occur immediately after the Big Crunch thus creating a cyclic model.

It is a theory that seems to play out in business – where players merge to form ever-larger organisations before breaking up again.

The other significant development in the power and energy universe last month was the deal between Germany's two largest utilities. In a move aimed at improving their international competitiveness, E.On and RWE agreed a complex acquisition and asset swap deal worth €60 billion.

The transaction will be executed in two stages. E.On will first buy RWE's 76.8 per cent stake in Innogy, the renewables energy business that was spun-out in 2016, and table an all-cash offer to Innogy's minority shareholders. In the next stage, E.On will hand back Innogy's renewable energy assets as well as its own to RWE.

It will leave E.On focused on regulated energy networks and retail customers. With ownership of the renewables businesses of both E.On and Innogy, RWE would become a leading green energy producer while diversify its exposure from its fossil-fuel generation. Both companies have been restructuring their businesses in response to Germany's *Energiewende* – the accelerated transition to renewables following the government's decision to gradually close the country's nuclear power plants.

Political leaders welcomed the deal, hoping the splitting of Innogy would leave Germany with two stronger companies better able to compete with their European rivals.

Brigitte Zypries, the Economy and Energy minister said: "It is good to have competitive and internationally focused energy suppliers in Germany. The current plans can contribute to this."

In a research note commenting on the transaction, analysts at Jefferies wrote: "... it would help E.On achieve scale and efficiencies in networks and retail, and transform RWE into a leading renewables and security of supply provider. However, this would involve another two years in costly restructuring."

The deal will have wide-ranging ramifications. For the UK, it comes as UK supplier Npower is set to form a new listed company with rival SSE. If both deals go ahead, E.On would end up with a stake in the new company. This would cut the UK's 'big six' firms to just four independent companies – British Gas, EDF, Scottish Power and E.On – raising major concerns over a lack of competition.

This could, in turn, result in higher prices for consumers. Rachel Reeves MP, chairman of the Commons' Business, Energy And Industrial Strategy Committee, warned: "This latest development risks being a major blow to competition in our energy market, reducing customer choice, and threatening to be a very poor deal for energy consumers in the UK."

Analysts at Investec said the deal posed "potentially significant competition issues in the UK supply market". However, Peter Earl, head of energy at Compare The Market, said that "a sizeable number of challenger brands have recently emerged onto the energy scene offering more competitive tariffs".

When looking at such developments, while at the same time considering the apparent move from large centralised electricity generation to a decentralised model, it is difficult to see whether the energy universe is in its expansion or contraction phase. We are entering a phase where competitors become and partners and consumers become producers.

At this brief moment in time, it would take a Professor Hawking to figure it all out.

I predict that in the future, to the Big Bang and the Big Crunch, we will be able to add the Big EU Fudge and the Big UK Energy Fix

