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Cyber threats
Are organisations properly assessing the risks?
Page 13

Going digital
Talking up the digital transformation.
Page 14

Final Word
Junior Isles looks at what's shaking up the world.
Page 16

News In Brief

Cost of offshore wind set to fall
The levelised cost of electricity (LCOE) from offshore wind parks looks set to fall further as a result of industry efforts supported by inter-governmental cooperation.
Page 2

Watts Bar 2 connects to grid
Watts Bar 2 has become the first new US nuclear power plant to come on-line in 20 years.
Page 4

Westinghouse finally starts work on Indian reactors
A nuclear agreement between India and the US finally took a significant step forward with news that Westinghouse Electric Co. has started "preparatory" work on six nuclear reactors.
Page 6

Investigation prompts retail reforms
The retail electricity sector in England and Wales is set to undergo further reforms following an in-depth investigation by the Competition and Markets Authority (CMA).
Page 7

Hassyan contracts signed
Dubai is diversifying its energy resources with the addition of key coal-fired and concentrated solar power projects.
Page 8

Areva, TVO talks collapse
Areva has vowed to continue with its restructuring in spite of the collapse of negotiations with Finnish firm TVO over problems at the Olkiluoto 3 nuclear power plant.
Page 9

Technology: Microgrids show the power of innovation
Microgrid technology is helping businesses to ensure power supply reliability while also boosting their green credentials.
Page 15

Uncertainty looms as UK exits EU

Amber Rudd: investments could be "re-evaluated"

The UK's vote to leave the European Union puts environmental policy at risk and could slow cross-border energy trading, leading to higher energy costs. **Junior Isles**

The shadow of uncertainty has been cast over the future energy landscape of the United Kingdom, and to some degree the European Union, following the UK's vote to leave the EU.

While there will no doubt be implications if the UK government follows the will of the public, the impact of Brexit is at the moment still unclear.

Ian Wood, Energy & Infrastructure partner at King & Wood Mallesons, said: "It is far too early to determine the full impact of Brexit on the energy and infrastructure sector. Much rests on how the UK positions itself after Brexit, but a vote to leave will trigger wide-ranging legislative change in many areas of regulation affecting the industry."

The law firm said there would be ambiguity surrounding the terms that UK energy suppliers would have with regards to access to European transmission networks and how Brexit would affect any ongoing energy supply contracts.

"Brexit may slow the cross-border trading of electricity across interconnectors between the UK and the EU," said Wood.

"What remains clear is the continuing obligation – for now – to comply with EU legislation, together with UK legislation which has its basis in EU law. Those who choose not to comply run the risk of financial – and potentially criminal – sanction for non-compliance."

Currently, nearly 4 GW of the UK's capacity comes from interconnectors with Europe. As these are subject to bilateral agreements rather than EU regulation, Brexit will not affect them. However, the proposed new interconnectors between the UK and Belgium, Norway, and Denmark could be impacted. The uncertainty caused by Brexit will raise concern about large investments, and the UK Energy Secretary Amber Rudd said that these investments "could be re-evaluated".

Tony Ward, EY's Head of Power & Utilities, noted: "Being an island with limited interconnection to the continent, the UK has out of necessity had to meet its energy needs… However, the UK has become increasingly dependent on the import of fuel and technology to construct and operate assets. If, as expected, sterling declines in the FX markets, the price of these imported resources may rise, increasing the costs to end users of energy in particular." Predictions are that by 2030 the UK will be importing around 75 per cent of its gas.

This view was echoed by Melanie Kendall-Reid, Compliance Director, CARBON2018 who said a total withdrawal from the EU with no EEA

Continued on Page 2

World leaders push for post-Paris action

Climate leaders are keen to implement the global climate change agreement reached at the COP21 conference in Paris in December.

With COP22 due in five months in Morocco, there is growing urgency to see the Paris Agreement enter into force by the end of the year. Moroccan Foreign minister Salaheddine Mezouar, who is also chairman of the COP22 steering Committee, said that November's summit is the time to "move from words to action" for countries to achieve national climate targets.

Speaking at the United Nations Environment Assembly in late May, Mezouar said Morocco would be "responsive" to any initiative for the implementation of the Paris Agreement.

The world's leading industrial nations appears to be in line with the call for action. At the conclusion of the G7 summit in Japan leaders issued a communiqué committing their countries to "taking the necessary steps" to secure entry into force this year of the Paris Agreement.

Leaders agreed to make their climate targets more ambitious in future, accelerate its work towards the transition to low-carbon energy systems, and phase out greenhouse gas emissions in the second half of this century.

According to the recent *BP Statistical Review*, carbon emissions stopped growing in 2015 for the first time in 10 years as the world turned its back on coal and embraced energy efficiency and renewable sources.

With the exception of a drop in global emissions around the time of the 2009 financial crisis, which heavily depressed overall business activity, the BP figure of 0.1 per cent growth in CO_2 is the lowest for 25 years.

Spencer Dale, BP's chief economist said the pledges and determination shown by world governments at the Paris climate change talks meant there would likely be "further policies aimed at shifting the fuel mix towards cleaner, lower-carbon fuels, with renewable energy, along with natural gas, the main beneficiary".

In addition to a shift to renewables, the International Energy Agency (IEA) believes cities have a key role in limiting carbon emissions.

In its Energy Technology Perspectives 2016, the IEA said the most cost-effective approach to limiting global temperature increase to the goals agreed in Paris involves deploying low-carbon options in cities, especially in emerging and developing economies.

According to the IEA at least two-thirds of the growth in global final energy demand to 2050 will come from cities in emerging and developing economies.

"Cities today are home to about half the global population but represent almost two-thirds of global energy demand and 70 per cent of carbon emissions from the energy sector, so they must play a leading role if COP21 commitments are to be achieved," IEA Executive Director Fatih Birol said at the launch of the report during the Clean Energy Ministerial in San Francisco at the start of June.

Continued from Page 1

(European Economic Area) membership would lead to "significant risk of both rising energy costs and security of supply as the UK has a heavy dependence on European interconnectors".

There is also considerable speculation as to what Brexit will mean for the UK's transition to a low carbon energy sector.

It remains to be seen if the UK will end its participation in the EU Emissions Trading Scheme (ETS), which in turn could mean removal of emissions taxes, or more likely the development of an alternative taxation regime. What impact there will be on trading and transferring EU emission allowances between UK and EU entities is also unknown.

Investment in the UK's renewable sector could also be impacted. The European Investment Bank (EIB) has invested £5.6 billion into renewable energy, with the UK being the biggest beneficiary, receiving 24 per cent of these funds. However, it is unlikely that the EIB would continue to fund UK projects to the same level. EU countries receive higher priority access and favourable terms for these funds, and it is probable that the UK

Grant called Brexit a "major setback" to tackling global environmental issues

renewable industry would suffer.

Jonathan Grant, Director, PwC sustainability and climate change, said the Brexit vote "is a major setback for the type of collaboration needed to tackle global environmental issues like climate change".

He added: "The UK government has been a champion of climate action at home, within the EU, and in the Paris climate talks. However this leadership is at risk, with many supporters of Brexit also opposed to climate policies such as carbon taxes and efficiency standards. The immediate priority will be to provide reassurance to investors to avoid undermining the low carbon sector. Any further uncertainty will unsettle the carbon market."

The price of EU carbon credits fell sharply when trading opened on the morning of the leave vote.

Aldersgate Group argues that it is in the UK's interest to continue to lead on environmental issues and grow the UK's thriving low carbon economy.

Noting that environmental issues featured very little on both sides of the EU referendum campaign, the Aldersgate Group said that the government should continue its work to improve the state of the natural environment at home and ensure the UK economy remained competitive at a time where the global market for low-carbon goods and services is rapidly growing.

Whatever government emerges in the aftermath of the leave vote it will need to clarify its policies with respect to climate change, renewable energy, technology preferences, state aid and many other matters of direct relevance to the energy industry, and to its investors.

Siemens-Gamesa merger underlines ongoing consolidation

Junior Isles

German wind giant Siemens and Spanish wind turbine manufacturer Gamesa have agreed to merge their businesses in what marks a significant development in the ongoing consolidation in the wind power industry.

It is the latest in a round of consolidations that has seen GE purchase Alstom's energy business and a merger between Germany's Nordex and Spain's Acciona Wind Power.

Prior to the deal Siemens was the world's second largest wind turbine supplier, with a 9.5 per cent market share, while Gamesa had a global market share of 4.5 per cent. The newly formed company valued at €10 billion will now leapfrog Vestas, which currently has a 12 per cent market share.

According to the agreement between Siemens and Gamesa, Siemens will receive newly issued shares of the combined company at €3.75-a-share, and will hold 59 per cent of the share capital. Gamesa's existing shareholders will hold 41 per cent. Iberdrola has entered into a shareholders' agreement with Siemens and will hold around 8 per cent in the combined company after closing of the transaction.

The new company, which will be consolidated in Siemens' financial statements, is expected to have on a pro-forma basis (last 12 months as of March 2016) a 69 GW installed base worldwide, an order backlog of around €20 billion, revenue of €9.3 billion and an adjusted EBIT of €839 million.

The combined company will have its global headquarters in Spain and will remain listed in Spain. The onshore headquarters will be located in Spain, while the offshore headquarters will reside in Hamburg, Germany, and Vejle, Denmark.

Siemens and Gamesa expect significant potential synergies in a combined setup. In total, annual EBIT synergies of €230 million are expected in year-four post closing.

The two businesses are highly complementary in terms of global footprint, existing product portfolios and technologies. The combined business will have a global reach across all important regions, and manufacturing footprints in all continents.

Siemens' wind power business has a strong foothold in North America and Northern Europe, and Gamesa is well positioned in fast-growing emerging markets, such as India and Latin America, and in Southern Europe. Further, the transaction will result in a product offering covering all wind classes.

Commenting on the merger, Joe Kaeser, President and CEO of Siemens AG said: "The combination of our wind business with Gamesa follows a clear and compelling industrial logic in an attractive growth industry, in which scale is a key to making renewable energy more cost-effective… The combined business will fit right into our Siemens Vision 2020 and underlines our commitment to affordable, reliable and sustainable energy supply."

The transaction is subject to approval by Gamesa's shareholders and to other customary conditions such as merger control clearances and the confirmation by the Spanish stock market regulator (CNMV) that no mandatory takeover bid has to be launched by Siemens following completion of the merger. Closing is expected in the first quarter of calendar year 2017.

The merger was simplified when French energy company Areva agreed to waive existing contractual restrictions in Gamesa's and Areva's offshore wind joint venture, Adwen. Gamesa has granted Areva a put option for Areva's 50 per cent stake and a call option for Gamesa's 50 per cent stake in Adwen. Both options expire in three months. Alternatively, Areva can in this time divest 100 per cent of Adwen to a third party.

Just ahead of the merger announcement, GE said it had entered talks with Areva, Gamesa, Siemens and the French state to discuss the potential acquisition of Adwen.

- China's state-owned investment holding company State Development and Investment Corporation acquired Spanish energy firm Repsol's offshore wind power business in the UK for €238 million.

Cost of offshore wind set to fall

- Industry says €80/MWh possible by 2025
- North Seas region countries agree to cooperate

Junior Isles

The levelised cost of electricity (LCOE) from offshore wind parks looks set to fall further as the result of industry efforts supported by intergovernmental cooperation.

German utilities, RWE and E.On, have joined Sweden's Vattenfall and Norway's Statoil to declare they can drive down LCOE to €80/MWh by 2025. Together with seven other companies, including turbine suppliers such as Siemens and GE, they say offshore wind farms can be "fully competitive" with new fossil fuel power stations "under the right conditions".

The declaration came in response to an agreement that North Seas region countries (Belgium, Denmark, France, Germany, Ireland, Luxembourg, the Netherlands, Norway and Sweden) plan to further strengthen their energy cooperation.

The aim of the agreement signed in June is to create good conditions for the development of offshore wind energy in order to ensure a sustainable, secure and affordable energy supply in the North Seas countries.

The political declaration and action plan signed by nine Ministers and Vice-President for Energy Union Maroš Šefčovič and by Commissioner for Climate Action and Energy Miguel Arias Cañete, will also facilitate the building of missing electricity links, allow more trading of energy and further integration of energy markets.

They said there was "a serious question mark" over what would happen after 2020, when current EU pledges to generate 20 per cent of energy from renewable sources expire.

Industry players say regulatory clarity is key in cutting the LCOE from offshore wind. Speaking at a press conference on the sidelines of RenewableUK's Global Offshore wind conference, Michael Hannibal, CEO, Offshore Wind at Siemens Wind Power said: "With the right market conditions, we can achieve €0.08/kWh, including the cost of grid connection."

He said this would partly be achieved by shifting to a larger turbine, probably of around 10 MW. State-of-the art turbines, currently around 6-8 MW, are likely to see the industry achieve its target of €100/MWh by 2020.

Siemens also expects its offshore grid connection platforms to contribute to lowering the cost of energy. At the conference, Mike Grainger, Head of Grid Access, Siemens UK noted the first two of its Offshore Transmission Modules (OTM) will be installed at the Beatrice offshore wind farm.

The industry is already looking at how it can cut the LCOE of offshore wind still further. In mid-June a consortium of 16 Dutch companies and research institutes announced plans to launch an innovation programme aimed at pushing down LCOE to €70/MWh by 2030.

The GROW (Growth through Research, development and demonstration in Offshore Wind) consortium will spend at least €100 million on research, development and demonstration projects over the next five years, with the first projects expected to commence in the fall of 2016.

The founders are Delft Offshore Turbine, Deltares, ECN, Eneco, Lagerwey, LM Wind Power, Royal IHC, RWE, Seaway Heavy Lifting, Shell, Sif, TenneT, TNO, TU Delft, Van Oord, and Volker Stevin International. The consortium will work together with the TKI Wind op Zee.

Renewables will attract huge global investment

Renewable generating capacity will attract trillions of dollars in new investment over the next 25 years, according to a new report.

BNEF's 'New Energy Outlook 2016' (NEO) states that during the 2016-40 period there would be $7.8 trillion of investments in green power, with onshore and offshore wind attracting $3.1 trillion, utility-scale, rooftop and other small-scale solar $3.4 trillion, and hydropower $911 billion.

The NEO forecasts renewables will dominate in Europe by 2040 and overtake gas in the US. Wind, solar, hydro and other renewable energy plants will generate 70 per cent of Europe's power in 2040, up from 32 per cent in 2015, according to BNEF. In the US, their share will jump from 14 per cent in 2015 to 44 per cent in 2040, as gas slips from 33 per cent to 31 per cent.

The report says that even low coal and gas prices will not prevent a fundamental transformation of the world electricity system in the coming decades towards renewable sources.

Elena Giannakopoulou, Senior Energy Economist, BNEF said there would be "no more golden age" for gas globally, except in North America. Gas will be surpassed by renewables by 2027. It will overtake coal by 2037, she added.

The report came as a new International Energy Agency (IEA) study claimed wind and solar power are entering a new phase of deployment and affordability.

Separately, in its annual overview of the status of renewable energy, REN21 stated that 2015 was a record year for renewable energy installations. Its 'Renewables 2016 Global Status Report' revealed that renewable generating capacity saw its largest increase ever in 2015, with an estimated 147 GW added.

In its recently released 'Global Market Outlook for Solar Power 2016-2020', SolarPower Europe said a total of 229 GW of solar power was installed globally at end of 2015, a more than 45-fold market increase in only 10 years.

Watts Bar 2 connects to grid

- 4540 MW of nuclear capacity under construction in USA
- Nuclear benefits undervalued, says WNA

Watts Bar 2 has become the first new US nuclear power plant to come online in 20 years.

The Tennessee Valley Authority's new generating unit was connected to the grid in early June and will start full commercial operations later in the summer.

It is the first of several new nuclear generating units set to start operating in the USA in the next four years.

"This is another major step in fully integrating Watts Bar Unit 2 as the seventh operating unit in TVA's nuclear fleet," said TVA Chief Nuclear Officer Joe Grimes. "It is rewarding to see TVA taking the lead on delivering the first new nuclear unit of the 21st century and providing safe, affordable and reliable electricity to those we serve."

The next step is full-plant testing of systems and controls at increasing reactor power levels up to 100 per cent power, TVA added in a statement.

Four other reactors are under construction in the USA and will add 4540 MW of generating capacity to the country's grid. These are Vogtle Electric Generating Plant Units 3 and 4 in Georgia, and Virgil C. Summer Nuclear Generating Station Units 2 and 3 in South Carolina.

Other nuclear generating units in the country are set to close, however.

Last month PG&E said that it would not seek to renew the licenses at the two reactors at the Diablo Canyon nuclear power plant, which are set to expire in 2024 and 2025. The company cited California's goal of producing 50 per cent of its power from renewables by 2030 as its main reason.

"California's energy landscape is changing dramatically," PG&E Chief Executive Tony Earley said. He added that nuclear power was "an important bridge strategy to help ensure that power remains affordable and reliable and that we do not increase the use of fossil fuels while supporting California's vision for the future".

Exelon also recently announced a plan to close early its Quad cities and Clinton nuclear power plants.

The International Energy Agency (IEA) noted in its Energy Technology Perspectives 2016 report that nuclear reactors are playing a vital role in avoiding greenhouse gas emissions and that early closures of operating plant would threaten the achievement of long term climate goals.

Agneta Rising, World Nuclear Association (WNA) Director General said: "These [Exelon] plants have performed excellently, particularly in recent years. The problem in Illinois and in some countries is that electricity markets and environmental policies are failing to value the low-carbon and reliable electricity that nuclear power plants supply."

Rising added: "In countries around the world a muddle of subsidies, taxes and short-term strategies are failing to provide a level playing field in which all low carbon generation can work together efficiently. This is bad for the economy, bad for jobs and bad for the environment."

Coal power falls to new low in US

- Regulations and renewables take their toll
- Trump promises to boost fossil fuel production

Siân Crampsie

The share of coal in the USA's electricity generating mix has fallen to a new low of just under 24 per cent, according to the US Energy Information Administration (EIA).

The EIA's latest figures show that coal use has continued its decline in the face of competition from cheap natural gas and renewables.

The amount of electricity generated by hydropower, wind, biomass, and geothermal sources together reached 19.2 per cent of all power generation in the US during March.

Non-hydro renewables also exceeded 10 per cent of net US power generation for the first time in March, with natural gas accounting for 34.1 per cent, and nuclear sources covering 21.8 per cent.

The trends highlight the continued challenging environment for coal-fired power generation, caused by new regulations and tight market conditions.

Last month the US Environmental Protection Agency (EPA) said that coal-fired power plants in Utah would require new pollution controls in order to reduce haze near national parks.

New controls on nitrous oxide emissions at Rocky Mountain Power's Hunter and Huntington power plants will help to combat haze near eastern Utah's Arches and Canyonlands national parks, in addition to other conservation and wilderness areas.

Rocky Mountain Power said it was disappointed with the decision because it will cost about $700 million to make the changes.

US Presidential candidate Donald Trump has sought to reassure the US coal lobby in May, promising to reduce regulations surrounding the fossil fuel sectors to aid production of both coal and shale gas.

Trump has also said that he would "cancel" the Paris climate agreement if elected.

Under pressure: coal fired generation has fallen to 24 per cent in the US electricity mix

Dong boosts US portfolio

Dong Energy has finalised a deal to take over the development rights to a 1000 MW offshore wind project in the USA.

Dong has purchased the rights for a 1000 MW development off the coast of New Jersey from RES Americas Developments Inc., and finalised the deal during Bureau of Ocean Energy Management (BOEM) New Jersey Renewable Energy Task Force Meeting held in Trenton in May.

The deal is a key part of Dong's plans to expand its offshore wind portfolio away from Europe and into nascent markets such as the Americas and Asia. RES Americas said it would continue to support the development of the lease area, which has been named Ocean Wind.

Dong said in a statement that it believes that the lease area, 88 km south of Martha's Vineyard, has strong development potential. It also has wind and seabed conditions similar to those found in north west Europe, the firm said.

"The US is an interesting new market for offshore wind with the potential to become a significant area for future development," said Samuel Leupold, Dong's Executive Vice President of wind power. "We have constructed around one third of the offshore wind capacity in the world and we are looking forward to bringing our skills and experience to this new market."

Thomas Brostrøm, Dong's General Manager of North America, Wind Power, said: "Dong Energy's entry into New Jersey is a great opportunity. As the world leader of offshore wind development, we look forward to expanding our profile in the US and potentially building an industry."

The New Jersey lease is the second US lease area for Dong Energy. The acquisition of the company's first US lease area, off the coast of Massachusetts, was approved by BOEM in June 2015.

Brazil commissions new wind

Wind energy generating capacity in Brazil is growing steadily with a raft of new wind farms preparing to start operating.

Iberdrola has announced that its 150 MW Calangos wind complex in Rio Grande do Norte state has come on-line, while Brazilian power sector watchdog Aneel has authorised three wind energy plants to start commercial or test operations.

Iberdrola developed the Calangos wind farm in conjunction with Brazilian power firm Neoenergia. It consists of five 30 MW wind farms equipped with Gamesa 2 MW G90 and G87 wind turbines.

Calangos was funded with the help of the Brazilian development bank, BNDES, as well as national bank Banco do Brasil, Iberdrola said.

The Calangos wind farm brings Iberdrola and Neoenergia's operating wind project portfolio in Brazil to 337.3 MW, with a further 178 MW in development.

A further three wind farms totalling 37.5 MW will start commercial or test operations in Brazil after receiving authorisation from Aneel.

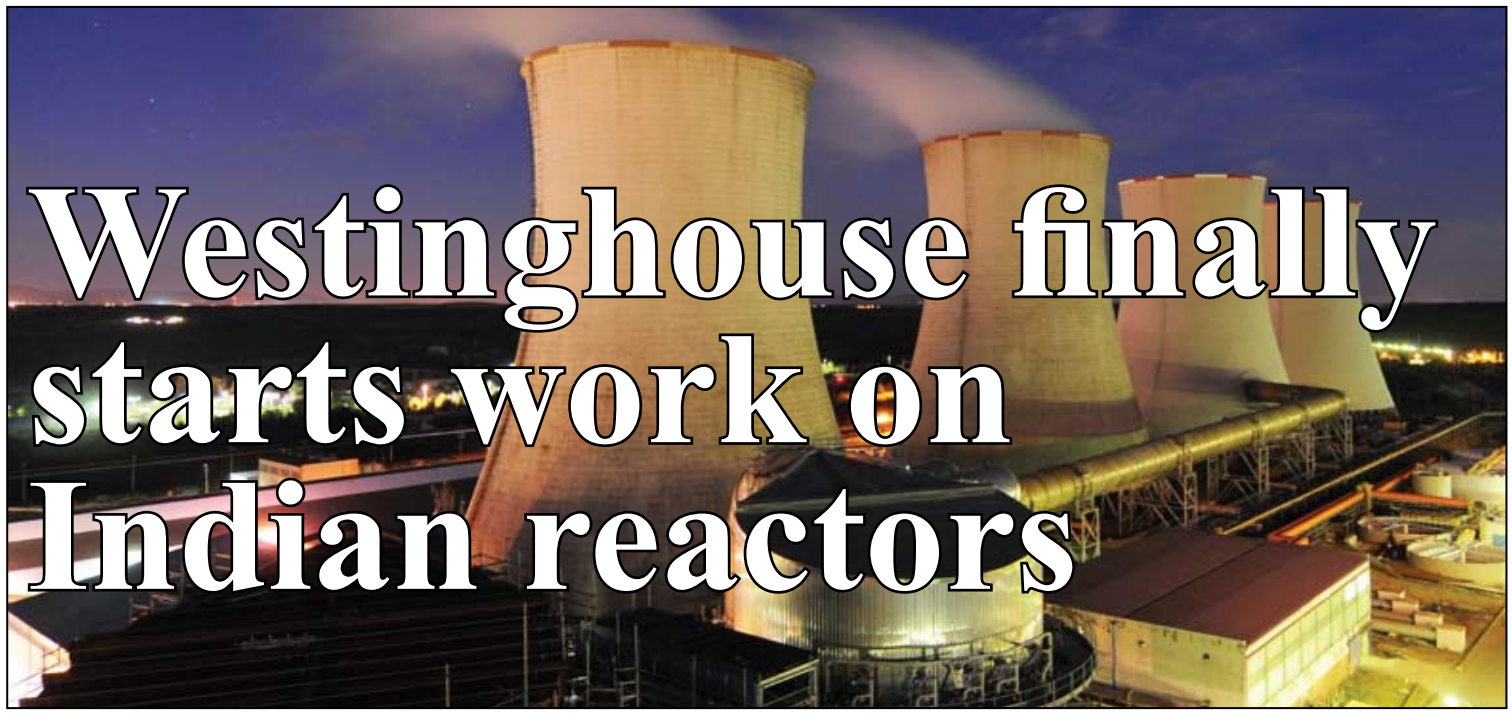
The Campo dos Ventos I and Macambira I wind farms will go online under test operations, while the Campo dos Ventos V received the green light for commercial operations, Aneel said.

First US HVDC link upgraded

An upgrade to the Celilo HVDC converter station in Oregon has helped to boost its capacity by 700 MW.

The Celilo converter is the northern station of the Pacific DC Intertie, a 1360 km HVDC link that plays a key role in transmitting electricity between the US Pacific Northwest and southern California. ABB has upgraded the Celilo station with a new control and protection system as well as modernising equipment including valves, transformers and switchgear.

The upgrade project was the fourth carried out on Celilo by ABB, the company said. "The Pacific Intertie was the first major HVDC link to be installed in the US and has been providing power to millions in the US for nearly five decades, and we are delighted to return to this pioneering project," said Patrick Fragman, Managing Director of ABB's Grid Systems business unit.



Westinghouse finally starts work on Indian reactors

Three years after signing a preliminary agreement to build several nuclear power plants in India, Westinghouse has finally been given the green light to start engineering and design work. **Syed Ali**

A nuclear agreement between India and the US finally took a significant step forward with news that Westinghouse Electric Co. has started "preparatory" work on six nuclear reactors. The plan was finalised during a meeting between US President Barack Obama and Indian Prime Minister Narendra Modi at the White House in June.

Following the meeting, Modi announced that engineering and design work has begun on a site for Westinghouse to build six AP1000 nuclear reactors in a deal that is expected to be signed by next June.

The deal has been a long time coming. In 2007 an international agreement made it legal for US companies to pursue nuclear contracts in India. This led to Westinghouse signing a preliminary agreement with the Nuclear Power Corporation of India in 2013 to build between two and eight reactors.

One of the main stumbling blocks has been India's nuclear liability law, which leaves nuclear equipment suppliers vulnerable to lawsuits from power plant operators and the public in the event of an accident. The Indian government moved to address the issue in 2015 by creating an insurance pool totalling $250 million that would pay out damages on behalf of nuclear equipment suppliers in the event that an operator decides to sue them.

Westinghouse spokesperson Courtney Boone said in a statement: "We are very pleased that the President and Prime Minister Modi… are supportive of our ongoing negotiations. It is clear that they, too, look forward to India and Westinghouse reaching an agreement in the very near term."

Financing is still being arranged for the project, with the support of the US Export-Import Bank.

The project would be the largest of its kind and fulfils a US-India civil nuclear agreement that demonstrates a shared commitment to meet India's growing energy needs while reducing reliance on fossil fuels, the statement also said.

Meanwhile, Russia is waiting for India to identify the location of a new nuclear power plant with six units, which will be constructed under an Indo-Russian agreement.

Vladimir A Angelov, Director for Projects in India, State Atomic Energy Corporation Rosatom, said in June: "We are waiting for the Indian party to identify the location for the new NPP. These six units will be VVER-type reactors each of 1200 MW."

Speaking at a recent conference in India, Angelov referred to the 2014 Strategic Vision for Strengthening Cooperation in Peaceful Uses of Atomic Energy between India and Russia wherein the two countries had decided on setting up of 12 units over the next two decades.

Rosatom is already involved in the design and execution of six nuclear reactors in Kudankulam, Tamil Nadu.

Thailand IPP backs off coal

Thailand-based independent power producer (IPP) Glow Energy is aligning its generating strategy with parent company Engie.

While announcing plans to re-power four coal fired units at two power plants in Rayong, Pajongwit Pongsivapai, Glow's Chief Financial officer said: "Over the next four years, Glow will look for new greenfield projects and mergers and acquisitions in both fossil fuel and renewable energy projects. However, we will not be involved with coal-fired power any more."

Glow is planning a capital expenditure of Baht 3-5 billion ($85-142 million) to re-power the four units, which have a combined generating capacity of 500 MW. The units received operating licences in 1996 and were due to retire in 2017 but the licences have been extended for 25 years.

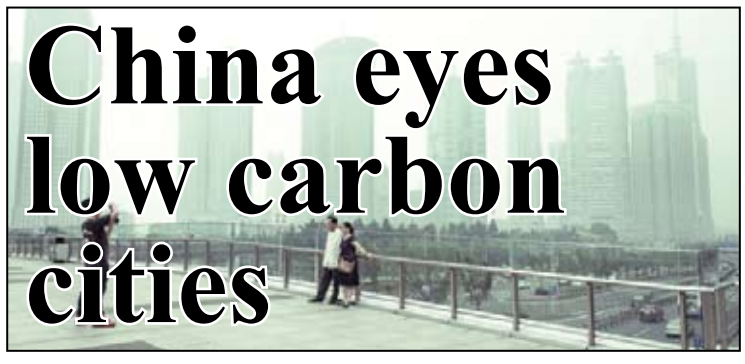
Other power plants run by Glow are expected to gradually retire over the next 10 years, including the SPP11 Phase 1 and Phase 3 in 2025. The SPP2 and SPP3 in Rayong's Map Ta Phut are due to retire in 2024, and the Gheco-One supercritical coal-fired plant is due to retire in 2026.

Glow's anti-coal stance is in line with Engie's commitment to curb greenhouse gas emissions.

Pajongwit said that many mid-sized firms had moved into renewable energy over the last several years to gain from higher tariffs relative to fossil fuels. "When the renewable energy business matures in Thailand, only professionals in the energy sector will be able to survive," he noted.

Glow says it will continue with its plan for solar farm projects by applying for the new round of licensing next year after failing to win one under the agricultural cooperatives solar farm scheme this year.

The company is also in talks with potential partners on investments in biomass, biogas and waste-to-power projects.



China eyes low carbon cities

Initial conclusions of a recent report show that $1 trillion is required over the next five years to build low-carbon cities in China.

The report, 'Green Finance for Low-Carbon Cities', is one of a series of three reports compiled by the Paulson Institute, Energy Foundation China, and the Chinese Renewable Energy Industries Association. The series is comprised of three separate reports, focusing on buildings, transportation, and energy.

Launched at the second China-US Climate-Smart/Low-Carbon Cities Summit in Beijing in June, the study aims to "set out a path for overcoming obstacles to making the kinds of investments that both protect public health and improve the economy" in cities across China.

Ma Jun, who chairs the Green Finance Committee, China Society for Banking and Finance, and supported the research, said: "Finance is at the heart of the economy, and green urban development in China cannot happen without support from green finance."

The report says that "city administrators need to achieve triple targets: ensuring adequate supply of energy, minimising energy costs, and protecting the environment", and that an estimated $77 billion is needed in investment to meet China's growing energy needs.

Former Mayor of New York City Michael R. Bloomberg, who writes in the introduction to the report's executive summary, says the study "identifies opportunities for cities to attract more private funding on projects to reduce emissions in the building, transport, and energy sectors".

He added: "China has set an ambitious goal of peaking national carbon emissions around 2030, wisely recognising that economic growth and fighting climate change go hand in hand."

In late May, the National Energy Administration (NEA) pledged to decrease the amount of coal burned in industrial furnaces and residential heat systems in an effort to improve air quality.

Currently, around 800 million tonnes of coal is burned directly each year, with direct coal combustion making up 20 per cent of the country's consumption.

At present, 75 per cent of China's total power generation is derived from coal. The NEA says it intends to replace direct coal burning with electricity and renewables, in addition to low-emission coal fired power plants.

Indonesia closes in on 35 GW target

- Financing secured for 2 GW Batang coal fired plant
- Mobile power plants to provide 2 GW stop-gap

Indonesia is closing in on its target to add 35 GW by 2020. In what is seen as a significant step, President Joko "Jokowi" Widodo recently signed off on the financial closure for six infrastructure projects, including the Batang coal fired power plant in Central Java.

The 2 GW Batang power plant, one of the largest in Southeast Asia, is an important part of Indonesia's ambitious plan. Construction of the $4 billion plant was initially earmarked to begin in 2012 and start-up in 2019. However, community protests against the plant on environmental grounds have caused delays.

The project was awarded to Bhimasena Power Indonesia, a joint venture between Adaro Energy, Japan's Itochu Corporation and the Electric Power Development Co., Ltd (J-Power).

Bhimasena secured a $3.4 billion loan for the project from a consortium of nine Japanese banks, of which $2 billion came from the Japan Bank for International Cooperation (JBIC).

"With this we can reassure the consortium that the chance in Indonesia is still available. Despite the slow pace, there is progress," Adaro President Director Garibaldi "Boy" Thohir said.

In the meantime, State electricity firm PLN is hoping to build gas-based mobile power plants (MPPs) with a total capacity of up to 2000 MW by the end of 2018 to cover the electricity gap. The plants will be mainly in Sumatra and Kalimantan.

After an initial MPP project in Mempawah was inaugurated on June 2, six MPPs are set to follow in Bangka (2x25 MW), Belitung (1x25 MW), Medan (3x25 MW), Nias (1x25 MW), Riau (3x25 MW) and Lampung (4x25 MW).

"The projects are worth Rp7 trillion ($528 million) in total and we are targeting 2000 MW from the MPP in 2017-2018," PLN President Director Sofyan Basir said.

Also in June, GE said it set up turbines for a 100 MW gas fired power plant in Gorontalo province. The four LM2500 aeroderivative gas turbines have been installed at PLN's power plant in Paguat, Pahuwato district.

Indonesia also says it hopes to establish waste-powered electricity plants in eight big cities within two years. To make the projects viable Maritime Affairs Minister Rizal Ramli said he will introduce the new tariff in eight cities, namely Jakarta, Bandung, Tangerang, Surabaya, Solo [Surakarta], Makassar, Medan and Semarang.

Investigation prompts retail reforms

A two-year investigation into competition in retail markets concludes that consumers are overpaying for their electricity in the UK to the tune of £1.4 billion per year.

Siân Crampsie

The retail electricity sector in England and Wales is set to undergo further reforms following an in-depth investigation by the Competition and Markets Authority (CMA).

The CMA is seeking to bring in a range of technical and regulatory changes in order to reduce energy prices, boost competition between suppliers, and encourage consumers to engage more with energy providers.

The CMA's two-year investigation found that 70 per cent of domestic customers of the so-called 'Big Six' suppliers are on an expensive default standard tariff and could be saving over £300/year each. It also found that customers on prepayment meters are limited in their options for switching, as are small businesses.

"Competition is working well for some customers in this market – but nowhere near enough of them," said Roger Whitcomb, Chairman of the energy market investigation. "Our measures will help more customers get a better deal and put in place a modernised energy market equipped for the future."

The measures that will be implemented include the creation of a secure database managed by regulator Ofgem that will enable rival suppliers to contact customers to offer cheaper deals. CMA also wants to reform outdated systems for measuring and charging energy that distort competition between suppliers, and has a proposed establishing a price cap for prepay consumers until the introduction of smart meters enables them to access better deals.

Dr. David Deller from the University of East Anglia called the remedies put forward by the CMA a "mixed bag" that would be beneficial but not necessarily transformational.

"The CMA's final report is in line with expectations," said Dr. Deller. "The most significant intervention is a temporary price cap for prepayment customers. This remedy appears broadly proportionate given the extra barriers to competition, and increased vulnerability of consumers, in this section of the market."

He added: "Compared to expectations at the start of the investigation, large energy companies are likely to be relatively pleased with the outcome, despite what they say publicly, while consumer groups will be disappointed."

There are also concerns that the proposed database will not encourage customer engagement. "I'm not convinced that a database of customers to be marketed to will get people switching more. If twerking men and meerkats on our TVs can't make you switch, then junk mail through your letter box won't," said Juliet Davenport, Chief Executive of energy supplier Good Energy, referring to commercials for price comparison websites.

"The CMA needed to adapt and be more forward-looking as sticky customers look for things like customer service, company ethics, local and green energy, and not just price," Davenport added.

Consumer group *Which?* called for the CMA's reforms to be implemented quickly. "With the cost to consumers of an uncompetitive market standing at £1.4 billion, it's high time for energy companies to accept they need to change," said Director of Policy and Campaigns, Alex Neill. "After a two year investigation, we need to see swift action by suppliers and Ofgem to set out how they will implement the review's recommendations.

"If the energy companies fail to show they can treat their customers fairly, and deliver better service and competitive prices, the regulator must be ready to come down on them like a ton of bricks."

■ A report by a committee of MPs has proposed replacing National Grid, which owns and operates the UK's gas and electricity transmission networks, with an independent system operator. The committee said that National Grid has too many conflicts of interest and that an ISO model would bring greater efficiency to the operation of the country's networks.

Sweden leaves door open for new nuclear

Nuclear power generation in Sweden will continue following a cross-party agreement that will cut taxes and allow for the construction of new nuclear capacity.

The agreement – struck in June – phases out the country's nuclear capacity tax on existing nuclear reactors and also calls for the country to attain 100 per cent renewable energy in its electricity production by 2040.

Nuclear energy companies from around the world welcomed the new policy, although there appeared to be confusion as to how nuclear power plants would fit into a 100 per cent renewable electricity system in the future.

French state-owned utility EDF, the world's biggest operator of nuclear reactors, said the June 10 agreement was a major boost for the nuclear industry, while Toshiba Corp.'s Westinghouse Electric urged other governments to follow Sweden's example.

Under the agreement, which takes immediate effect, the output tax will be reduced in 2017 and abolished by the end of 2019. As many as 10 of Sweden's 14 reactors will be replaced after 2020, though its four oldest reactors, Ringhals 1 and 2 and Oskarshamn 1 and 2, will not be replaced.

The agreement also calls for expanding Sweden's hydropower network, primarily through upgrades to existing plants, and will also reduce the taxation rate on hydropower facilities.

Solar, wind and other renewable power sources will receive government support up to 2030.

Vattenfall said that the agreement acknowledged the importance of nuclear energy while committing Sweden to a renewable future. "The abolishment of the nuclear capacity tax is an important precondition for us to be able to consider the investments needed to secure the long-term operation of our nuclear reactors from the 1980s," said Magnus Hall, CEO of Vattenfall.

He added: "Even with the abolishment of the capacity tax, profitability will be a challenge. Low electricity prices put all energy producers under pressure and we will continue to focus on reducing production costs."

Spain wins approval for mine closures

Spain will be able to spend €2.13 billion on the closure of 26 coal mines following approval of its plans by the European Commission.

The proposed government expenditure will cover production losses as the uncompetitive mines wind down, provide financial support to laid-off workers through severance payments and social security benefits, and finance safety and other works after the mines close.

The European Commission approved the expenditure under state aid rules.

■ Poland is drawing up plans to help coal-fired power generators invest in new capacity. Coal fired power plants account for over 80 per cent of electricity generation in Poland and the government is concerned that energy security will be put at risk if energy companies cannot invest in existing and new assets.

Tidal projects reach milestones

The MeyGen tidal energy project is on track to deliver first power in the second half of 2016 following the completion of a new underground power export cable.

Project developer Atlantis said that completion of the new 33 kV cable marked a major technical milestone for the project, located off the northern coast of Scotland.

The new cable is one of the longest underground 33 kV power export cables in the UK and will connect the first phase of MeyGen to the 33 kV network, owned and operated by Scottish Hydro Electric Power Distribution plc.

MeyGen will eventually have an installed capacity of 400 MW. Tim Cornelius, CEO of Atlantis, said that the planned start up of the project would be a "huge event" for both the company and the global marine energy industry.

In France, another significant tidal project also reached a milestone when the second of two turbines was lowered into the water.

The Paimpol-Bréhat tidal array project is owned by EDF and will be the world's first grid-connected tidal farm when it starts up this summer. It will use two OpenHydro tidal turbines and deliver 1 MW of energy to the French grid.

"OpenHydro, DCNS and EDF have worked hand-in-hand to deliver this milestone for the tidal energy industry," James Ives, CEO of OpenHydro, said in a news release. "Paimpol-Bréhat is a global industry first; giving us key insights into the operation of our turbines at array scale."

The tidal array is located near Paimpol, a mile off the northern coast of France. It took a day for the turbine to be towed from the French port of Brest to the tidal array, where a purpose-built barge deployed the turbine within an hour.

Ives commented: "On a technical and industrial level, it will help us prepare for delivery of EDF Energies Nouvelles' Normandie Hydro project – a 14 MW array set to be deployed in 2018."

The MeyGen tidal energy project is on track to deliver first power in the second half of 2016

USAID funds new power connections

The US government has delivered one of the largest loan facilities within the Power Africa initiative, the US Agency for International Development (USAID) has announced.

The $60 million loan to Zambia's Electricity Supply Corporation (Zesco) will finance capital expenditure on the Lusaka Transmission and Distribution Rehabilitation Project (LTDRP) as well as provide bridge financing to facilitate new connections to the grid.

It was arranged and facilitated in partnership with Standard Chartered, USAID said, and will assist Zesco in meeting its target of electrifying 60 per cent of Zambia by 2030.

"Part of Zesco's strategic plan is to improve the quality of electricity and enhance connections to the national grid," commented Zesco's Managing Director, Victor Mundende. "USAID and Standard Chartered's support has already delivered more than 15 000 new power connections. Furthermore, some of the funds provided will be used for other scheduled power system upgrades, contributing to new and existing connections to homes and businesses across the country."

Zambia suffers regular blackouts because of reduced capacity at the country's hydroelectric power plants. Lake Kariba, the main source of Zambia's electricity, is at just 12 per cent of its capacity because of drought.

Dependence on hydropower has led Zesco to seek other sources of energy, including solar power.

In May, Zambia's Industrial Development Corporation (IDC), opened bids from seven renewable energy developers seeking to build large-scale solar energy plants in the country.

The IDC said that the provisional results of the tenders indicated that a Neoen-First Solar venture and a bid from Enel Green Power would win the two projects.

Jordan progresses on nuclear projects

The Jordan Atomic Energy Commission (JAEC) says it is in discussions with a number of international groups for the supply of equipment for the country's first nuclear power plants.

JAEC Chairman Khaled Toukan told local media that negotiations are ongoing with firms such as Shanghai Electric, China National Nuclear Corporation, Alstom and other Japanese and Czech companies to provide the necessary electric systems and turbines for the two reactors that will be built at Qasr-Amra in Al-Azraq province, about 70 km south east of Amman.

Toukan also said that JAEC is in negotiations with several regional investors on a second project to develop a uranium mill facility capable of producing 400 metric tonnes of uranium per year by 2021, enough to power the two 1000 MW reactors.

Production will later increase to 15 000 tonnes per year, said Toukan, enabling Jordan to export fuel to several countries in the region that have plans for nuclear reactors including the UAE, Egypt, Turkey and Saudi Arabia.

Jordan's first nuclear reactor is expected to be ready by 2023, while the second will go online by 2025. The projects are seen as being essential to meeting growing energy demand in Jordan and improving the country's energy security.

Jordan has low-cost uranium resources of 140 000 tU plus another 59 000 tU in phosphate deposits, according to figures from the World Nuclear Association.

Hassyan contracts signed

- PPA takes ACWA closer to financial close
- DEWA hopes for competitive CSP bids

Siân Crampsie

Dubai is diversifying its energy resources with the addition of key coal-fired and concentrated solar power projects.

The emirate lacks the huge oil reserves of its neighbour, Abu Dhabi, and is turning to coal and renewable energy to meet energy demand and improve energy security.

The Dubai Electricity and Water Authority (DEWA) recently announced it had signed a power purchase agreement (PPA) and shareholders agreement with ACWA Power and Harbin Electric for the planned 2400 MW Hassyan clean coal power plant.

The deal came just days after DEWA said it was in the final stages of tendering the first phase of what is expected to be the world's largest concentrated solar power (CSP) plant.

The Hassyan power project will be developed by ACWA Power as an independent power project (IPP), supported by a 25-year PPA. The first 2400 MW phase of the project comprises four 600 MW units. The second 1200 MW phase of the project includes two 600 MW units with ultra-supercritical technology.

The planned commercial operation date of the project is March 2023. HE Saeed Mohammed Al Tayer, MD and CEO of DEWA said: "The Hassyan project reflects DEWA's commitment to its goals of energy diversification and sustainability of resources, and achieving the Dubai Clean Energy Strategy 2050, which focuses on producing electricity from clean coal as part of Dubai's energy mix."

Dubai's Clean Energy Strategy envisions a diverse electricity generating mix, with a quarter of power derived from solar energy, seven per cent from nuclear power plant, seven per cent from clean coal, and 61 per cent from gas by 2030.

Al Tayer said in June that DEWA had issued a call for tenders inviting international solar consultants to submit proposals on the first 200 MW phase of the emirate's first CSP plant.

The developer for the 200 MW initial phase of the project is expected to be announced in early 2017. The entire project is expected to generate 1000 MW once it is fully operational in 2030 within the Mohammed bin Rashid Al Maktoum Solar Park.

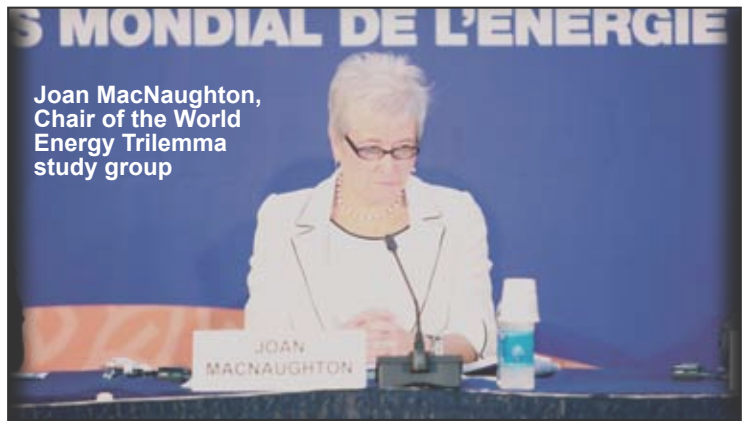
Al Tayer said that DEWA is hoping to attract the world's lowest rates for CSP technology in the competitive bidding process.

WEC calls for policy innovation

The energy sector is at a transition point and faces a number of growing challenges that can only be addressed through the use of innovative policies and technologies, the World Energy Council (WEC) has said.

Launching the latest version of its World Energy Trilemma report, WEC said that implementing good energy policies with a clear sense of strategic direction was the key to a strong 'trilemma performance' – i.e., balancing energy security, affordability and access.

"The Paris Agreement has raised the bar on what countries must do to have a sustainable energy policy – one which delivers not just on energy security, access and affordability; but is also capable of delivering the Paris commitments," said Joan MacNaughton, Chair of the World Energy Trilemma study group. "More substantive dialogue with business leaders and the investment community will help policymakers to produce policies which are robust in a world of fast changing dynamics of energy supply and demand and an accelerating pace of technological and business change.



Joan MacNaughton, Chair of the World Energy Trilemma study group

"The sooner countries start on the transition, the cheaper it will be."

The report highlights five key findings emerging from innovative policies, interviews with policymakers and private sector energy leaders and an analysis of five years of the Energy Trilemma Index. These include the need to set clear energy targets, reforming regulatory frameworks to attract private investment, address affordability and long term subsidies, encourage efficiency and implement dynamic and flexible renewable energy investment policies.

"Solely expanding infrastructure is not enough," said MacNaughton. "Countries must look to a range of innovative mechanisms that enable access for people to utilise the benefits of modern energy for income-generating activities. Pay-as-you-go business models and mobile banking solutions to promote the take-up of renewable powered energy services are examples of such mechanisms."

Saudi Arabia installs first wind turbine

Saudi Arabia is tapping into its wind energy potential as part of plans to grow its renewable energy capacity.

The Kingdom's first wind turbine will be installed in the northwest of the country by Saudi Aramco and GE, displacing the use of diesel engines at the Turaif bulk plant.

The initiative to demonstrate the use of wind energy in Saudi Arabia is in line with the country's Saudi Vision 2030, which has established a target of 9.5 GW of installed renewable energy capacity by 2030.

The project also marks the first regional use of GE's 2.75-120 wind turbine unit, which has been customised for Saudi Arabia's climatic conditions.

Several studies have confirmed the potential for wind energy generation in the Kingdom, particularly in the northern region. According to the Renewable Energy Atlas, higher wind speeds near 8.0 m/s and above occur in the northeast and central regions of Saudi Arabia, as well as near mountains in the western region. These speeds are well above a standard economic viability speed of approximately 6 m/s, GE said in a statement.

In Saudi Arabia, King Abdullah City for Atomic and Renewable Energy (KACARE) is leading the Kingdom's drive toward diversification of energy sources, with special emphasis on solar energy.

KACARE and the Asir Governorate recently signed a joint agreement on the development of renewable energy and converting solid waste into green energy to reduce dependence on fossil fuel.

The agreement includes a number of important items such as converting municipal solid waste into electricity, developing green buildings, monitoring and measuring the sources of renewable energy in the Asir region, and using the techniques of renewable energy in applications such as lighting parks and streets.

According to KACARE, Saudi Arabia will have an installed wind energy generating capacity of 9 GW by 2032, and up to 41 GW of solar capacity, split between photovoltaics and concentrated solar power.

Power price pressures set to continue

The pressure on utilities across Europe will continue thanks to continued weak power and commodity prices, Moody's says.

Plans undertaken by European utilities to counter falling commodity prices may not be sufficient to safeguard their cash flows and balance sheets in the longer term, according to Moody's.

The Ratings agency says in a new report that although many European utilities are implementing new strategies to cope with the pressures of the trading environment, a recovery in power prices in the medium term is unlikely. Downward pressure on cash flows across the sector will therefore continue, it said.

E.On and Vattenfall are among those firms that have embarked on business transformations to reduce their exposure to commodities and build up contracted and regulated business units. Plans vary among utilities, but broadly include measures to strengthen balance sheets, such as cost reduction, asset disposals, capital increases, and reviews of dividend policy.

"Plans announced in recent months by European utilities are broadly supportive of credit quality," said Paul Marty, Moody's Vice President and Senior Credit Officer. Moody's says that power prices have declined by up to 30 per cent since early 2015 but were unlikely to recover in the near- to medium-term given overcapacities and ongoing growth in renewables.

It adds in its report that as commodity-linked earnings decline as a result of lower prices and asset disposals, and as companies deliver on their investment strategies, business risk profiles will continue to strengthen and may result in improvement in debt capacity.

"Utilities' and power companies' ability to execute on their strategies and financial flexibility will drive credit quality," added Marty.

Moody's said in May that Iberdrola is one utility that has been sheltered from weak power prices in Europe because of its long-held strategy of switching from conventional generation to renewables.

Moody's also expects Iberdrola's exposure to commodity prices to fall further thanks to its 2016-2020 strategic plan, which is designed to accelerate the company's pivot away from conventional generation towards renewables, networks and contracted generation.

E.On meanwhile has been given the go-ahead by its shareholders for the spin off of Uniper, the business unit created by the energy giant for its conventional energy generation and trading business.

The vote at its annual shareholders meeting paves the way for E.On to fully implement its new strategy of focusing on renewable energy, networks and customer solutions.

The spin-off of Uniper is likely to take place in the second half of 2016, E.On said.

Areva, TVO talks collapse

- Arbitration decision "some years off"
- Areva devises plan B

Siân Crampsie

Areva has vowed to continue with its restructuring in spite of the collapse of negotiations with Finnish firm TVO over problems at the Olkiluoto 3 nuclear power plant.

Areva is planning to sell its nuclear reactor division to French state-owned utility EDF and accept a €5 billion capital increase from the French government as part of a wide-raging restructuring package.

However, there are concerns that the collapse of talks between Areva and TVO aimed at reaching a settlement over the delayed Olkiluoto 3 project could hinder Areva's plans.

In particular, clarity on the future of the Olkiluoto 3 project, and Areva's liabilities, is needed for the €2.5 billion sale of Areva NP to EDF. TVO has also expressed concerns about the future of the project, and of the EPR nuclear reactor technology that it will use, in the wake of France's nuclear energy industry restructuring.

"OL3 will be, when up and running, a flagship reference for the EPR technology, which will be followed from all over the world," said TVO President and CEO, Jarmo Tanhua. "The French nuclear industry is at a crossroads. The success of the rescue operation is of utmost importance, and we are ready to support it.

"As a customer, we, however, cannot carry the plant contract obligations and risks of the plant supplier. To be competitive, the French nuclear industry has to ensure their technological and industrial capabilities and be committed to the ultimate project completion. The OL3 Project has to be seen as a possibility, not a risk."

Talks between TVO and Areva collapsed in early June and a final award on all the issues "seems to be some years off", according to Dorothy Murray of law firm King & Wood Mallesons. "While there can be ways to expedite the resolution issues, whether by seeking interim or partial awards, or adopting expedited processes, it seems very unlikely to happen here," said Murray. "The sheer size of the sums at stake – €3.5 billion claimed and €2.3 billion in counterclaim – means that the parties and arbitrators will be unwilling to be seen to rush matters, as this can provide grounds on which to challenge enforcement of any resulting award."

The Olkiluoto 3 project is one of the main reasons for Areva's financial woes. The project is ten years behind schedule and €5 billion over budget. TVO said last month that the project had reached its final stages and would start up by the end of 2018.

Areva CEO Philippe Knoche told the *Financial Times* in June that it had worked out a 'plan B' to ensure that its restructuring will go ahead even if arbitration with TVO does not re-start.

This would involve moving all the activities of the old Areva NP except the Finnish project into a new company that could then be bought by EDF. The risk for the Olkiluoto 3 project would then remain indirectly with the French state.

Rina eyes renewables growth in acquisition of Edif

Junior Isles

The growing renewable energy sector will present Italian company Rina S.p.A, with one of its most important opportunities for growth following its acquisition of Edif Group.

In a deal valued at approximately £118 million, the multi-national testing, inspection, certification and consulting engineering group bought the Edif Group, which includes the ERA engineering consultancy and the NDE testing, inspection and certification business.

Edif is seen as a good fit. Commenting on the deal, Ugo Salerno, CEO at Rina said: "Edif is well established in the areas of electrical infrastructure, mainly electrical networks – an area where we were not present.

"Geographically, they are strong in the UK, where Rina Group has a very limited presence. The UK offshore wind market is attractive and Edif has very good experience in renewables.

"This is clearly the moment of renewables. We are looking at some marine installations of wind farms. Here we combine the experience of being a classification society with the experience of an engineering company that can work on the engineering side of structures."

He said the Edif purchase is aimed at improving Rina's competitiveness. "We have identified two main routes to do this. One is to strengthen our international presence and the other is to complete the type of activity and the skills that we have available. So we were looking for companies that could add value geographically and in terms of knowledge."

Rina has grown rapidly over the last decade or so. Just 12 years ago it had a turnover of €90 million and 720 employees. Today it employs more than 3000 people and has a turnover in excess of €375 million. The acquisition of Edif is part of a strategy to drive further growth. The acquisition will boost turnover to more than €500 million this year, said the company.

Salerno commented: "The company has grown successfully in the last years but organic growth is no longer sufficient. We are now looking to grow through acquisitions."

Energy, i.e. oil and gas and power, is one of four areas that the company operates in. The addition of Edif will see energy account for about 40 per cent of its activity.

RES targets offshore Asia

RES is seeking growth in the nascent Asian offshore wind energy markets through a new deal with DOHWA Engineering Co. of South Korea.

The two companies have signed a memorandum of understanding outlining the principle arrangements for cooperating on offshore wind energy projects planned for installation off the coast of South Korea.

The partnership will see RES providing offshore marine project management expertise along with specific package management support. In return, DOHWA will employ RES as its supplier of choice for offshore consultancy.

In addition, DOHWA Engineering will benefit from RES' offshore wind knowledge from working on projects in Europe and the USA, while RES will benefit from DOHWA Engineering's local consultancy expertise.

"RES sees the Far East region as the fastest growing new sector in offshore wind and are keen to share our experience of working in offshore wind projects with the new sector," said Kevin Todd, RES Offshore Business Development Manager for Asia. "Finding local partners is important to facilitate our expansion in the region; DOHWA are a large successful business wishing to also move into Offshore Wind."

Todd added: "Korea and other major Far East countries see the importance of investing into the offshore wind industry to diversify their energy mix and meet CO_2 targets. The industry in this region is just starting and RES will be at the forefront."

Americas

ABB supports Memphis smart meter project

ABB has been selected to provide wireless network products and services to support the deployment of smart meters across the City of Memphis, Tennessee, in the USA.

The introduction of smart meters is expected to improve efficiency of electricity, water and gas supplies and mitigate loss and theft in the city. The wireless network will support advanced metering infrastructure (AMI) communications, covering an area of around 2030 km^2 and will collect data from nearly 1 million smart meters.

Siemens signs US wind services deal

Siemens has signed its first long-term balance-of-plant (BoP) wind service agreement in the USA.

The German firm has signed a long-term contract extension for service and maintenance at the 152 MW Keenan II wind farm in Oklahoma that will add BoP to the scope and extend it for another 15 years.

Siemens will provide an additional 15 years of service and maintenance for the 66 SWT-2.3-101 turbines installed at the Keenan II wind farm, located near Woodward, OK. The plant is owned by CPV Keenan II Renewable Energy Company.

The service and maintenance will be supported by Siemens Digital Services, including advanced remote monitoring and diagnostics services, Siemens said.

Siemens has been providing service and maintenance on the 66 SWT-2.3 wind turbines at the Keenan II wind farm since it went into commercial operation in December 2010.

Asia-Pacific

Bangladesh orders HVDC back-to-back link

Power Grid Company of Bangladesh (PGCB) has placed an order with Siemens for an HVDC back-to-back link to connect the power supply networks of India and Bangladesh.

The order is a follow-up to a contract delivered by Siemens in 2013 for the installation of block 1 of the Bheramara HVDC back-to-back station. The latest contract will result in the installation of a second block with a transmission capacity of 500 MW.

The order value is approximately €130 million and the power link is scheduled to come on line in the second half of 2018.

Hubco signs digital power plant agreement

GE has signed a contract with Hubco to provide its digital industrial solutions for the 1292 MW Hubco power plant in Baluchistan, Pakistan.

The digital solution will help Hubco to enhance the reliability of its operations, according to Khalid Mansoor, the firm's CEO.

Powered by Predix, GE's cloud-based operating system built exclusively for industry, GE's Digital Power Plant includes a suite of software solutions that can enable Hubco's power plant operators to analyse and monitor operations across all touch-points in real-time and help identify any maintenance issues ahead of time, leading to greater asset uptime and reduced unplanned downtime.

The Baluchistan Hubco power plant is equipped entirely with non-GE equipment, demonstrating the power of Predix to operate across different types of original equipment manufacturers, GE said.

Siemens supplies Japanese wind project

Siemens has received the first order from J-Wind Setana to supply, install and commission 16 direct-drive wind turbines for the 50 MW Setana Osato wind power plant in the east of Hokkaido Island.

After commissioning in 2018, Siemens will also be responsible for the service and maintenance of the wind turbines within the framework of a long-term service contract.

Europe

Ramboll supports Lynemouth conversion

Ramboll has been appointed to provide engineering consultancy services to the proposed conversion of Lynemouth Power Station from coal to biomass.

Ramboll earlier won contracts to support development phases of the 390 MW project and will now provide owner's engineer services including project and programme management, expert design review, safety and site management, and coordination of several construction packages, managing cross-cutting interface issues for LPL.

Overall Ramboll expects to supply in the region of 50 man-years of support. The firm's scope of supply also includes the power plant site fuel storage and handling and a project to build a new biomass import terminal at the Port of Tyne, Newcastle.

SgurrEnergy boosts portfolio

SgurrEnergy has secured a three-year asset management contract for the Harburnhead wind farm in Scotland.

The 51.7 MW project will bring SgurrEnergy's operational management portfolio to over 150 MW of assets. It is currently in the construction phase and is due to be commissioned in late 2016.

SgurrEnergy's operations and maintenance team will provide round the clock monitoring, control and grid point services via their 24/7 control centre, ensuring that project performance is continually observed with an expert team ready to respond within the deadlines required for National Grid requests.

The team will also undertake site management, operations management, performance analysis and high voltage switching and maintenance for the duration of the three-year contract.

Gamesa to service Vapat turbines

Gamesa has secured a new seven-year agreement with the Vapat Group to provide operation and maintenance services covering wind energy capacity totalling 216 MW in Spain.

This marks the renewal of the operation and maintenance of this customer's G90-2.0 MW turbines, installed in several wind farms throughout Castile and León, which the company has been servicing since they were commissioned in 2010.

Energinet selects Nexans cables

Energinet.dk, the Danish Transmission System Operator (TSO), has signed a framework agreement with Nexans to deliver around 500 km of high voltage (HV) cables.

The cables will be used for a series of 170 kV projects from 2017 to reinforce the Danish grid and meet the growing demand for energy in the region.

The contract, worth more than €20 million, will see Nexans supply and install cables with a cross section of between 800 and 2000 mm^2. The cables will have a solid aluminium conductor and an aluminium wire screen.

Horns Rev 3 to use 8 MW turbines

MHI Vestas Offshore Wind and Vattenfall have signed a contract for the supply of V164-8.0 MW turbines to Denmark's 400 MW Horns Rev 3 project.

The contract was signed following Vattenfall's announcement of the final investment decision to construct the 400 MW Horns Rev 3 project off the west coast of Denmark.

MHI Vestas Offshore Wind will supply 50 wind turbines to the project, which will produce the world's cheapest offshore wind power.

International

Israel awards industrial combined cycle contracts

Siemens has received an order from Israel for the first time for the turnkey construction of two industrial combined cycle power plants. The two natural gas-fired power plants, Alon Tavor and Ramat Gabriel, are to be built in northern Israel. The Israeli energy provider, RD Energy, is the customer for both power plants. Commissioning of the plants is scheduled for mid-2018.

Siemens will handle the turnkey construction of both plants and will supply one SGT-800 industrial gas turbine, one SST-300 industrial steam turbine as well as the SPPA-T3000 control system for each project. The industrial plants will each have an electrical capacity of 70 MW and feature steam extraction. Electricity will be fed into the Israeli power grid. The turbines will be manufactured in Finspong, Sweden and Brno, Czech Republic.

Dubai to tender for largest CSP plant

Dubai Electricity and Water Authority (Dewa) is in the final stages of tendering the first phase of what is expected to result in the largest concentrated solar power (CSP) plant.

The developer for the 200 MW initial phase of the project is expected to be announced early 2017. The tender for leading international CSP consultants is already out, while the bidding process is expected to commence in the next three months.

The entire project is expected to generate 1000 MW once it is fully operational in 2030 within the Mohammed bin Rashid Al Maktoum Solar Park at an estimated cost of Dh50 billion ($13.6 billion), based on current rates.

Dubai is also looking to record the lowest CSP pricing in the world once the bidding starts.

Zambia awards 47.5 MW solar power contract

Neoen and First Solar have won a bid to construct a 47.5 MW solar power project in Zambia.

The consortium was awarded the project by Zambia's Industrial Development Corporation (IDC) at a tariff of $0.06/kWh, the lowest seen to date in sub-Saharan Africa. The project is also the first to be developed under the World Bank's Scaling Solar programme.

Scheduled to be completed by mid-2017, the facility will be located in the Lusaka South Multi-Facility Economic Zone and the IDC will retain a 20 percent stake in the project. The energy generated by the facility will be supplied to Zesco, the state-owned utility company, under a 25-year Power Purchase Agreement (PPA).

Battery for decentralised off-grid system

German commercial storage system manufacturer Tesvolt has been awarded a contract to supply the world's largest decentralised off-grid storage system.

Tesvolt will deliver a lithium storage system with a total capacity of 2.68 MWh to Rwanda. The storage system will act as a minigrid during power cuts and provide agricultural water pumps with emergency power.

The battery will be linked to a 3.3 MW solar power plant and is expected to be called into service up to four times a day. "For this reason, an important criterion in the call for tender was that the storage system is able to absorb electricity from the PV power plant and release it again as quickly as possible," said Simon Schandert, Director of Engineering at Tesvolt.

MAN to boost Comoros baseload capacity

MAN Diesel & Turbo has concluded a contract to deliver five engines for a new power plant in Moroni, the capital city of Comoros.

The scope of supply included four 18V28/32S engines and one 7L27/38S unit, as well as auxiliary equipment, spares, tools and services for the supervision of installation and commissioning.

The 18 MW plant will be constructed by Bharat Heavy Electricals Limited (BHEL) and will be operated by the national Comoros Energy Department, providing baseload power to the public grid.

It will replace three existing, outdated power stations in order to increase the overall efficiency and capacity of power generation in the small island nation.

Jordan expands Maan wind farm

Gamesa has secured a new order from Elecnor for the expansion of the Maan wind farm in Jordan with the addition of seven new G97-2.0 MW wind turbines.

Elecnor is building the project on a turnkey basis for the Jordan Ministry of Energy (MEMR) in southern Jordan. The first phase of the wind farm, for which Gamesa supplied 33 G97-2.0 MW wind turbines (66 MW), was commissioned two months ago.

Gamesa will deliver the seven wind turbines towards the end of 2016. The extension will be commissioned in the second quarter of 2017.

Design contract for Lower Kalekoy hydropower plant

Kalehan Genc Enerji Uretim A.S. has awarded Poyry a contract to provide detailed design services for the Lower Kalekoy hydroelectric power plant and dam project in Turkey.

The assignment includes the execution of the detailed design for the civil engineering of the powerhouse, and structural reviews, including the concrete dam, power intake and penstocks, spillway, diversion structures with two tunnels and bottom outlet. The installed capacity of the Lower Kalekoy plant will be 500 MW with an annual generation of around 1200 GWh. The detail design will be executed jointly with consortium partner Temelsu up to the end of 2017.

Oil

Crude prices rise but higher prices remain a long shot

- Oil glut could end by end of 2016, says IEA
- US prices could remain in $50/b range or some time

David Gregory

Crude oil prices touched $50/b in June amid considerable speculation that oil prices are on a track to go higher. Whether this proves to be the case will depend on how quickly global markets absorb all the oil available.

Last month in an interview with the *Houston Chronicle*, Saudi Arabia's new energy minister Khalid Al-Falih proclaimed that the oil glut that had taken oil prices to under $30/b was now over. Falih claimed that oversupply had disappeared. "We just have to carry the overhang of inventory for a while until the system works it out," he said.

His comments followed the International Energy Agency (IEA) report earlier in the month that said growing oil demand in Asia and disruption in oil production in many parts of the world could bring about the end of the oil glut by the end of 2016. Global supply declined by 800 000 b/d during May, the IEA said, the first big decrease since early 2013. Supplies from Opec and non-Opec countries declined during the first quarter, while global demand averaged 95.4 million b/d in May.

Global oil demand growth averaged 1.6 million b/d during the first quarter of 2016, the IEA reported, adding that demand growth for 2016 should average 1.3 million for the year and that demand growth during 2017 would remain at that level. Demand for oil during 2017 is forecast to average 97.4 million b/d, the IEA said.

Non-Opec production is seen as declining by 900 000 b/d during 2016 but coming back by 200 000 b/d in 2017. Opec oil output fell by 110 000 b/d during May to 32.61 million barrels. However, Opec members Iran and Iraq are pushing to expand production. Iran saw production rise in May to 3.562 million b/d from 3.473 million b/d in April, according to Opec data. Iraqi production slipped by 60 000 b/d during May to 4.281 million b/d from 4.342 million b/d in April.

Libya, Nigeria, Venezuela and Angola all saw output fall during May. Libya has the capacity to produce 1.6 million b/d, but the civil war forced output to under 300 000 b/d in May.

In the US, where crude oil production rose significantly in recent years due to hydraulic fracturing (fracking) – a practice that prompted Saudi Arabia to boost its own oil production to maintain its market share – crude oil production has declined by 900 000 b/d since April 2015 to a current average of 8.7 million b/d, according to data released by the US Energy Information Administration (EIA). Practically all of this decline occurred in the lower 48 states, but the decline is offset by growing production in offshore fields in the Gulf of Mexico.

The Saudi strategy of flooding the market with oil has apparently worked, forcing many US oil producers to shut production in the face of falling prices.

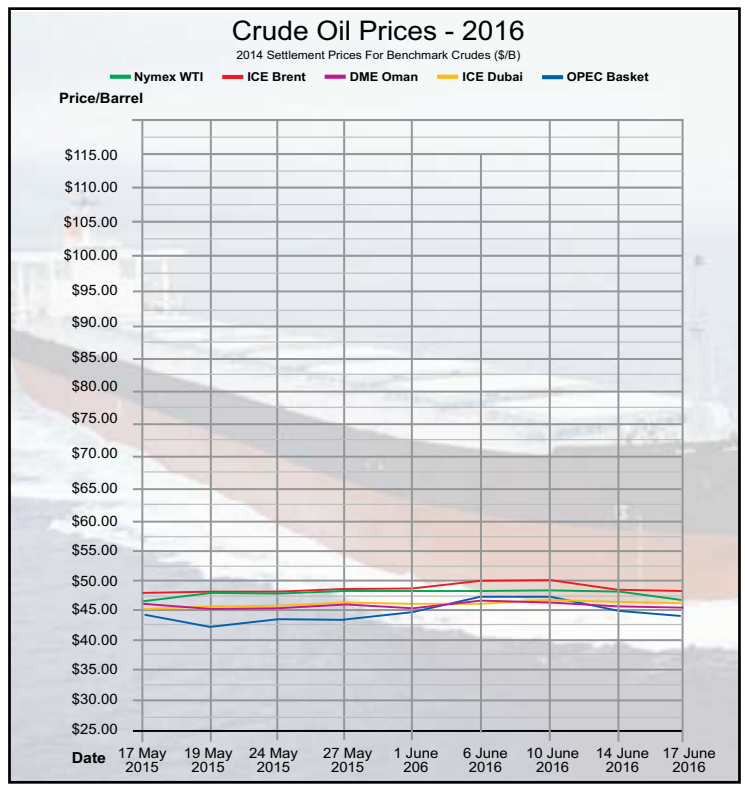
US crude oil production is forecast to fall from 9.4 million b/d in 2015 to an expected average of 8.6 million b/d in 2016 and to 8.2 million b/d in 2017. The EIA said, based on current price forecasts, it expects US oil production to continue to decline in the onshore 48 states through 2017.

"The expectation of reduced cash flows in 2016 and 2017 has prompted many companies to scale back investment programmes, deferring major new undertakings until a sustained price recovery occurs," the EIA said in its latest monthly energy report, and that the economic conditions will not be favourable for many smaller producers.

Not everyone is convinced that the oil market is recovering, even though oil has seen the $50/b mark. The US reported oil stock inventories of 532 million barrels, which conveys the impression that prices in the US could remain in the $50/b for some time.

Furthermore, the argument remains that should prices rise to $60/b, $70/b or beyond, the financial situation for US frackers would change enough to bring them back into the market. The theory goes that US shale/tight oil is the new swing producer that will keep the price of oil in a range $50-$80/b range well into the future.

The argument is also being made that China and India will also develop their shale/tight oil and gas reserves for the sake of meeting their own domestic demand. Perhaps the current glut will eventually ease, but there is argument to be made that $100/b oil is a long shot, short of a major catastrophe.



Gas

Facing over-supply, gas producers consider options

The international gas market is due for a shake-up, experts and analysts conclude, but where that shake-up will take the gas sector remains a subject of debate.

Mark Goetz

Many industry experts say the market is currently over-supplied and point to the large volumes of LNG that are on the market, the low price, and soft demand. Others argue there is no glut as reported. Meanwhile, LNG producers are looking to develop markets in areas that have yet to make use of natural gas.

Demand for natural gas increased slightly during 2015, according to the Paris-based International Energy Agency (IEA), which released its annual *Medium Term Gas Market Report* last month. Gas demand has since 2012 increased at a rate of just over 1.0 per cent a year, but slower than the historical 10-year average of 2.2 per cent, the report said.

The IEA forecast that gas demand would reach 3.9 trillion m^3 in 2021, increasing by 1.5 per cent annually and the equivalent of an incremental 340 billion m^3 between 2015 and 2021. But that increase will come within the context of a subdued global economy.

Slower growth in demand for gas and a decline in the use of energy in the global economy are cutting demand growth for all fossil fuels, the IEA said, noting that an "energy transformation" in China and unimpressive economic growth in advanced economies are holding back energy demand in general.

"Slowing primary energy demand growth means that the share of gas in the world's energy mix will still increase marginally over the next five years," the IEA said.

The US shale gas industry is responsible for much of the situation in today's gas market. The high volumes of shale gas production have reduced the US domestic gas price to around $2.50 per million BTU. Analysts say that the US can expect low gas prices for years to come.

Earlier this year the US began to export LNG and is looking to secure buyers in Europe, but there are questions about whether those buyers are there and if US LNG will be able to compete with prices of around $4.00-4.50 per million BTU in an environment where gas demand and demand for power are also declining.

According to the IEA, the next five years will see some major shifts in global gas trade patterns as demand for LNG weakens in traditionally strong markets like Japan and South Korea. But China, India and the ASEAN countries will emerge by 2021 as important markets.

Over the course of the next five years, large quantities of LNG are going to become available despite lower gas prices and reduced demand. This will impact trade and keep spot prices under pressure. The combined factors of cheaper coal and continued strong growth in renewable energy growth will prevent gas from expanding more rapidly in the power sector, according to the IEA report.

But some LNG producers are not leaving demand growth to chance. A recent report by *Reuters* said companies like Shell and Total are looking to move into the downstream by building gas-fired power plants, pipelines, and regasification and gas storage terminals in locations where such facilities do not now exist.

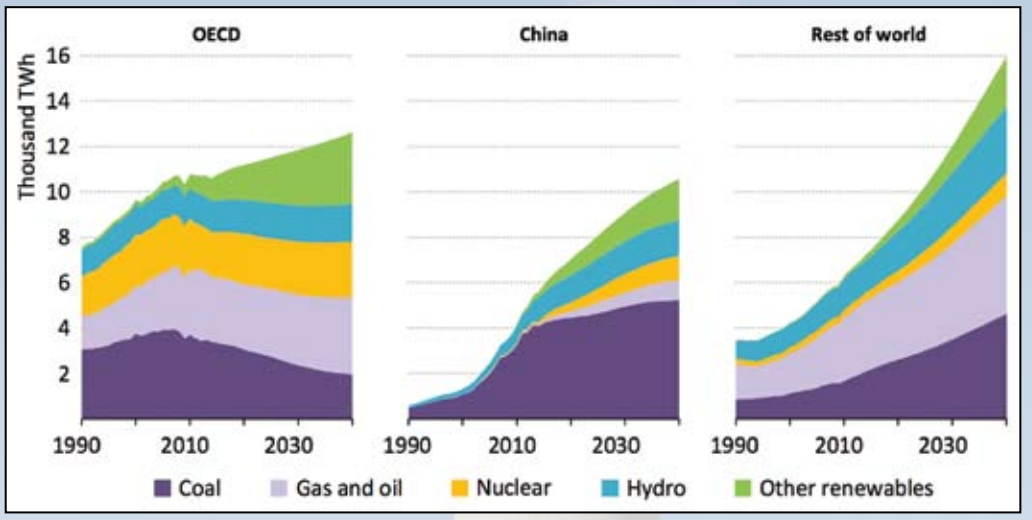
A number of companies have invested billions of dollars in LNG facilities and now face the prospect of an over-supplied market. The report quoted an executive from Total who said the French major is ready to go downstream as much as it takes to unlock gas demand. "We need to be present in downstream ourselves, to create demand and unlock bottlenecks along the chain including regasification, pipelines and power plants," the executive said.

An official from Shell was reported as saying that the company can see the potential to develop 50 different markets for LNG between now and 2030.

This is certainly an opinion shared by US LNG exporters. Proposals are in the works regarding the creation of floating storage and regasification units (FSRUs) for Croatia and northern Greece. The Croatian terminal would feed gas into the Balkan states, which depend on Russia for much of their supply, and the terminal in northern Greece would be used to the same effect.

A terminal at Alexandroupolis could link into the Interconnector-Greece-Bulgaria (IGB) project and deliver gas to countries in Southeast Europe. Pipeline extensions and interconnections between existing pipelines in Southeast and Central Europe would enable US LNG delivery to more markets. The plan has also mentioned the possible delivery of US gas to Ukraine through the Aegean terminal.

Electricity generation by source and region in the New Policies Scenario, 1990-2040



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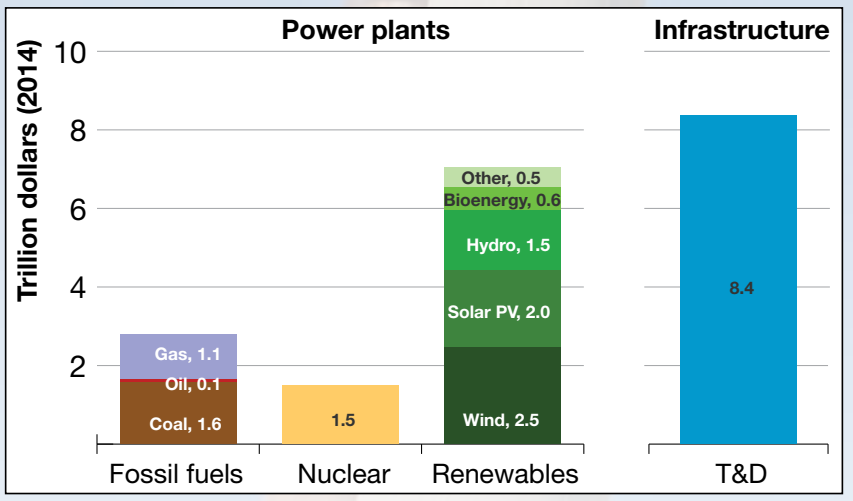
Global cumulative investment in the power sector by type in the New Policies Scenario, 2015-2040



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Cumulative investment in the power sector by region and type in the New Policies Scenario, 2015-2040 ($2014 billion)

	2015-2025						2026-2040						2015-2040
	Fossil fuels	Nuclear	Renewables	Total Plant	T&D	Total	Fossil fuels	Nuclear	Renewables	Total Plant	T&D	Total	Total
OECD	**370**	**265**	**1 183**	**1 818**	**1 106**	**2 925**	**377**	**438**	**1 686**	**2 501**	**1 404**	**3 904**	**6 829**
Americas	137	98	441	675	447	1 122	219	174	616	1 009	645	1 654	2 776
United States	*108*	*79*	*344*	*531*	*357*	*888*	*176*	*159*	*477*	*813*	*493*	*1 306*	*2 195*
Europe	136	97	510	743	424	1 167	103	202	801	1 105	469	1 575	2 742
Asia Oceania	98	70	232	400	235	635	55	62	269	386	289	675	1 310
Japan	*58*	*14*	*159*	*232*	*119*	*351*	*21*	*22*	*155*	*198*	*150*	*348*	*699*
Non-OECD	**892**	**329**	**1 482**	**2 703**	**2 260**	**4 963**	**1 162**	**463**	**2 697**	**4 322**	**3 592**	**7 914**	**12 877**
E. Europe/Eurasia	172	82	50	304	195	498	152	139	138	429	274	703	1 202
Russia	*83*	*66*	*21*	*170*	*74*	*244*	*73*	*84*	*71*	*227*	*111*	*338*	*582*
Asia	514	217	1 080	1 811	1 514	3 325	739	248	1 714	2 702	2 269	4 970	8 296
China	*215*	*172*	*641*	*1 028*	*881*	*1 909*	*202*	*157*	*791*	*1 150*	*1 079*	*2 229*	*4 138*
India	*148*	*29*	*252*	*429*	*301*	*730*	*282*	*67*	*499*	*848*	*544*	*1 392*	*2 122*
Southeast Asia	*110*	*2*	*85*	*198*	*245*	*442*	*177*	*16*	*228*	*420*	*465*	*885*	*1 328*
Middle East	92	21	45	157	117	274	65	32	210	307	167	474	748
Africa	83	0	127	211	241	451	163	27	349	539	583	1 122	1 573
Latin America	31	9	180	220	194	414	42	16	286	345	300	645	1 059
Brazil	*6*	*5*	*112*	*123*	*108*	*230*	*8*	*11*	*157*	*175*	*174*	*349*	*580*
World	**1 262**	**594**	**2 665**	**4 521**	**3 366**	**7 887**	**1 538**	**901**	**4 383**	**6 823**	**4 996**	**11 818**	**19 706**
European Union	*132*	*99*	*455*	*686*	*373*	*1 059*	*83*	*197*	*751*	*1 031*	*392*	*1 423*	*2 482*

World Energy Outlook 2015, © IEA/OECD, Table 8.5 , page 321

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Source: World Energy Outlook 2015

Quantifying cyber exposure

Cyber security is a real and growing threat – a risk that organisations often fail to quantify adequately.
Paul Armstrong

The December 2015 attack on the power distribution grid in the Ivano-Frankivisk Oblast region of Ukraine has cast the uncomfortable spectre of effective disruption to the power sector. The big question of course is: does it go beyond the obvious heightened geo-political issues in the Ukraine and could it happen to you?

According to Verizon's Breach Report, it probably already has: you may be part of the almost 60 per cent who just don't know it. Organisations are wrestling with misunderstanding and misinterpretation of cyber risk. The attack in Ukraine utilised a state sponsored attack tool known as BlackEnergy that disconnected several substations from the distribution grid, wiped the data, destroyed the IT infrastructure at the machine code level, preventing its ability to re-boot. These OEM vendors are supplying your industrial control systems, so yes, absolutely, it could happen to you.

BlackEnergy infection

The US Department of Homeland Security (DHS) announced on October 29, 2014 that several industrial control systems – vendor-issued programmes used by private companies to manage internal systems – had been infected by a variant of a Trojan horse malware program called BlackEnergy.

Infected programs such as GE Cimplicity, Siemens WinCC and Advantech/Broadwin WebAccess have been used by companies responsible for portions of the country's critical infrastructure, including "water, energy, property management and industrial control systems vendors" according to DHS.

Armstrong: too often, organisations see cyber risk as a discrete risk

Too often, organisations see cyber risk as a discrete risk but in the energy sector it is much more about being an enabling and amplifying factor for existing categories of risk. Attempting to treat cyber as a discrete risk can lead to a domino of decisions that are a function of specious logic. One example of this is when the board poses the challenge: "Are we covered for this cyber stuff?" Too often the response is: "Most of the products are not fit for our purpose, they are expensive and the capacity is insufficient to trouble our retentions: we should self-insure."

However, the issue here is not the risk transfer market, but the quality of the question. It assumes that cyber risk is discrete when in fact it is anything but discrete: it enables, accelerates and amplifies existing risks already well understood in the portfolio – it makes risks that you are accustomed to worse.

The misunderstanding is that we want to treat cyber as a discrete category and get the products to address the exposure in the portfolio. The fact, however, is the products were designed to provide 1st party cost offset to an organisation to help to recover from a successful breach, not to provide portfolio provision for the incremental exposure in the portfolio.

When viewed through this lens, most of the products make more sense. They provide for technical resources to contain and remediate a breach; legal and PR resources to engage with customers and regulators and technical skills to conduct post-incident forensic investigation. They can also provide for credit monitoring of 3rd parties who may be caught up in the attack. Also in this context, the capacity is relevant.

Reflecting on the German blast furnace incident in 2015, this was a cyber-attack on a minor support system for environmental control. However, it led to one of the blast furnaces being destroyed. The catastrophic impact of a blast furnace blowing up was already well understood and embedded in the Enterprise Risk Register. However the quantification of the exposure assumed that although it had a big impact, there was a relatively low probability of occurrence leading to a quantification of X as the provision in the enterprise risk management (ERM).

Cyber vulnerabilities, however, make these things worse, usually by increasing the probability of occurrence such that the exposure was probably two or three times the provision made. Had the organisation known its level of exposure, it would almost certainly have made different decisions about the level of retained risk and the approach to funding that risk. It would almost certainly have bought bigger limits on its property cover, would have challenged the CL380 exclusion and would have reflected on casualty and business interruption at the same time.

Of course, addressing the exclusions that prevail in the energy sector is easier said than done. However, although the majority of products available for discrete cyber liability cover are focused on the well-understood data breach, there are four or five that recognise the significant differences between enterprise technology, data confidentiality focus and the industrial control system availability and integrity priorities of the operational technology environment.

Within this small product group are those that can write a substantial primary layer to act effectively as a buy-back wrapper around an exclusion allowing the cover where the peril resides (like Property) to be triggered. This can only be done however if the increased cyber contribution to the peril is quantified rigorously.

This misunderstanding of the nature of cyber risk is exacerbated by inaction. For every other category of risk, an organisation uses exhaustive and rigorous means to quantify the exposure before making informed choices about the deployment of capital to address the exposure on the balance sheet; seeking to strike the best balance of risk mitigation, retained (and funded) risk and risk transfer. And yet for cyber we don't do that, instead, we spend a ton of money on consultants, a ton of money on technology and at the end of the expenditure the CFO still can't quantify the cyber exposure in the portfolio. That does not seem to be a good outcome.

In the meantime, the Network Information Security Directive emerging from the European Union will introduce a compliance requirement for mandatory reporting of breaches of networks not necessarily focused on data. Industrial control networks will be caught in this for organisations in the top two levels of critical National Infrastructure. Penalties for non-compliance will be draconian, €20 million or two per cent of global turnover for the most aggravated cases.

This is important because in the US, the Department of Homeland Security (US ICS CERT) has intentionally suppressed the release into the public domain those successful attacks on Critical National Infrastructure if they've been reported. Whilst this stimulates reporting, it does nothing for the visibility of the scale of the problem, nor of the community's ability to learn from others' misfortunes. Certainly it contributes to the boardroom challenge of accepting the scale of the threat we all face.

We need to promote a discipline that normalises how we manage cyber risk so that it can be embraced within the existing disciplines of enterprise risk management. It allows an organisation to take back control of decisions in relation to capital expenditure to address incremental cyber exposure.

A cyber roadmap should reflect an assumed relatively high level of internal cyber defence maturity for the organisation whilst acknowledging that there is likely to be a delta between the business and enterprise (data centric) cyber defence posture and that of the industrial control environment of the physical control of the plant and machinery in the facilities.

Organisations need to quantify their cyber exposure as it applies to the risks already identified within its enterprise risk management framework: in other words, how much worse do cyber vulnerabilities make the existing exposure. The importance of the quantification is that it helps the organisation approach the decisions about addressing the exposure with the most effective deployment of capital to address the exposure in exactly the same way it approaches these decisions in every other category of risk.

In conducting the quantification of exposure it will allow the organisation to make informed choices as to the most appropriate choices for mitigation of risk, retention (and funding) of risk and transfer including reflecting on existing covers and limits. Organisations would need to leverage the content from work already done within the organisation to understand: the critical business systems and the critical systems required to enable those processes.

This allows the development of the critical digital asset register (data, applications, infrastructure and 3rd Party service providers) against which a threat assessment is conducted followed by a vulnerability assessment.

The effectiveness of an organisation's cyber defence posture should be reviewed focusing on four key pillars: effectiveness of definition of critical digital assets; the effectiveness of assimilation and management of the threat surface; the effectiveness and dynamic nature of the definition of critical cyber defence controls; the effectiveness of the definition and policing of effectiveness of outcomes derived from the critical controls.

This assessment of the cyber defence effectiveness is the 3rd layer of a quantification tool. This approach generates a mathematical factor that is then applied to the existing quantified risk artefacts in order to generate a financially quantified view of the incremental cyber exposure.

Armed with this, the organisation would be able to formulate decisions about the most effective use of capital relative to both individual risks and aggregated as total area under the exposure curve providing the opportunity to re-visit retained risk decisions in terms of scale, funding, captive, and re-insurance.

This portfolio view allows organisations to better understand where cyber peril resides, it provides a means to ensure that the risk in the portfolio can be addressed in the context of well understood perils and use the discrete cyber liability insurance products specifically for the purpose for which they are intended and where their capacity limits are relevant as part of a portfolio approach.

Cyber risk and exposure is becoming more and more pervasive and threatens the core of our operations. Organisations have a fiduciary duty to understand and quantify their exposure and make appropriate provision for it. Most organisations, however, are not including the quantification of their cyber exposure in the overall picture and this means that most organisations have unaddressed exposure on their balance sheets because of cyber vulnerabilities and few organisations are doing anything about it – sad but true.

These options would include analytical broking support to assess existing covers in relation to the specifics of exposures identified to ensure that when addressing the risk transfer solution options, that the existing coverage programme is leveraged for maximum effect.

Peter Armstrong is Executive Director, Cyber, at Willis Towers Watson. He sits on the UK's Defence Cyber Protection Partnership, is a representative on the UK Cyber Growth Partnership and sits on the TechUK Cyber Management Committee. Peter has particular expertise in Industrial Control Systems cyber security within the Critical National Infrastructure Environment including the nuclear sector.

Moving into the digital age

GE's Jeff Immelt at its Minds + Machines event in Paris

GE outlined the importance of digitalisation in the power sector at its recent 'Minds + Machines' event in Paris. The move to a digital world, however, must be mindful of the threat to cyber security.
Junior Isles

The digital initiative is the biggest initiative inside the company today," said GE Chairman and CEO Jeff Immelt, at the company's 'Minds + Machines' industry event in Paris. "It is the biggest transformation in the history of the company."

GE says the revenue generated from digitalisation, across all its divisions currently stands at just over $6 billion and is growing at 25 per cent a year. Immelt predicts the company's digital revenue will reach $15 billion by 2020.

While the digital transformation is typically associated with terms such as: "Industry 4.0, the Industrial Internet and the Internet of Things", Immelt said none of those buzz words really matter.

"It's about productivity; industrial companies need productivity," he said. "We averaged 4 per cent productivity from 1990 to 2010; the average industrial company today is seeing one per cent productivity. So we need something that's going to boost that – to be more competitive and drive more growth and job creation. The merger of information and industry – the Digital Twin – is a technical change that is very profound."

GE sees digitalisation as the next step in improving productivity, with the focus being on improving customer outcomes. The theory is that in the power sector, things such as fuel efficiency, operational efficiency and diagnostics, can be massively increased by the combination of data analytics and physical assets. Essentially, it is the linking of information technology (IT) with operational technology (OT) through the Industrial Internet for asset performance management.

The power sector could be GE's most important in the move to digitalisation. Putting it into context, Steve Bolze, President and CEO, GE Power said: "Power is one of the biggest industries on the planet, and in the next 20 years the world will need 50 per cent more of it… [The move to] digital will have the single biggest impact for change on the industry and is opening up opportunities for our customers."

According to GE, recent studies estimate that the digitisation of products and services will add more than €110 billion in annual revenue for industry in Europe over the next five years.

A report released by the World Economic Forum this year talks about unlocking €1.1 trillion of opportunity within the energy industry in the next 10 years.

One area Bolze cites is unplanned downtime, where he says more than 75 per cent of unplanned outages can be predicted. "This is about 50 per cent of that €1.1 trillion value."

Last September GE announced the Digital Power Plant, a software and hardware solution that creates a virtual "Digital Twin" of an entire industrial power plant complex. "Digital Twin" is a collection of physics-based methods and digital technologies that are used to model the present state of every asset in a Digital Power Plant or a Digital Wind Farm.

According to Bolze, since its introduction for gas fired combined cycle plants, GE Power has 20 customers, essentially driving over €800 million in terms of impacts on customers' operations by allowing higher gas turbine output, improved plant efficiency, less downtime and lower operation and maintenance costs.

The application runs on Predix – GE's platform that enables any kind of asset to be connected via the industrial cloud. Predix enables users to manage and analyse massive volumes of diversified industrial data in real-time and thus identify inefficiencies.

During the event, GE Power introduced Digital Power Plant for Steam to enable its customers to improve the efficiency and reduce emissions from coal-fired plants. With coal plants generating 40 per cent of the world's electricity, GE says the new software can reduce CO_2 emissions from those plants by 2 per cent and reduce fuel consumption by 67 000 tons of coal per year with the same MW of output based on a 1000 MW power plant.

Digitalisation is also having a big impact in transmission and distribution. Reinaldo Garcia, President and CEO, GE Grid Solutions, said: "A 50 per increase in generating capacity would require a huge increase in the physical size of a conventional grid. Digitalisation gives a smarter way to accommodate the capacity and the increasing amount of distributed generation."

GE is particularly excited about its digital substation, which is receiving increasing interest. Scottish Power Energy Networks (SPEN) recently selected GE to supply the digital control system for its Future Intelligent NEtwork SubStation (FITNESS) project.

The FITNESS project will provide a complete intelligent digital substation solution that enables faster deployment, greater availability, improved safety and greater controllability with a reduced footprint and cost. It will be the first live project in the UK to demonstrate multi-vendor interoperability through the IEC 61850 standard. Multi-vendor interoperability will give customers the freedom to plug and play with the best solutions to fit their needs, irrespective of vendor.

Digital substations could play an important role in the UK's energy and climate goals. Commenting on the announcement, Herve Amossé, General Manager, Grid Automation at GE's Grid Solutions said: "Our solution allows utilities to have real-time information on how energy flows in the grid, enabling quicker decision-making and greater electricity availability. The ability to effectively integrate more renewable energies, while optimising allocation of capital and operational expenditure, is key as the UK moves towards lowering its carbon footprint."

Colin Taylor, Director Engineering Services, SPEN said: "FITNESS is a ground-breaking project, as after successful demonstration it will change the way we maintain and build new substations."

Better outage management is important to companies like Scottish Power. Laurent Schmitt, Smart Grid Strategy Leader at GE Grid Solutions noted: "Scottish Power wants to minimise the time it takes to correct faults on lines when they occur around the substation. We have created an app that uses algorithmic end-data to predict the location of faults."

Karim El Naggar, CDO, GE Energy Connections added: "How to reduce outages is the number one issue for utilities."

El Naggar notes that most of the solutions his division provides are aimed at tackling the rising cost of outages. "We are seeing digitisation increasing at the transmission level and even more so at the distribution level, as utilities look at how to reduce outages.

"For example, some of our latest technology on the distribution side, such as self-healing networks, means operators don't have to do anything to reconfigure the network and restore power."

Yet while greater digitalisation has many benefits it also brings threats, perhaps the biggest being that of cyber security. "It is top of the mind for a lot of our customers," said El Naggar.

A big risk in the utilities and energy space is that old scada systems were never designed to be part of the mainstream network, which ultimately opens up the possibility of risky traffic passing between devices in the field and front of house systems.

El Naggar says, however, GE includes cyber security in many ways in what it does. "We build cyber security into our products and processes… while there are more questions around cyber security when you're talking about a cloud platform, I would argue that today more and more people are realising that a cloud solution for industrial applications that has cyber security built-in, which is the case with Predix, can be more secure than a traditional on-premise solution."

Stuart McDonald, Managing Director, Seric Systems agrees. "Any system is only as good as its architecture. There is no reason why a cloud-based system is inherently more or less secure than another system. Organisations need to think about: where data is held; properly assessing the data they have; and determining the risk to the organisation or individuals that might be part of that data if it got into the wrong hands – but if that risk is small, the cloud can be a great answer for organisations."

Digitalisation has many advantages and is a transformation that is unavoidable but as utilities and companies alike unlock those benefits, they must be mindful not to compromise their operations and organisations.

Cyber talk

The industry has become a lot more vigilant than it has been with regards to cyber security and work still continues to eliminate weaknesses in data security. For example, directors are being made aware of their responsibility in terms of data protection.

Moves such as the General Data Protection Regulation (GDPR) will help keep data from falling into the wrong hands. The European directive, which comes into force in May 2018, will require organisations to demonstrate their compliance. It will also see fines for data breaches increased to 4 per cent of an organisation's global turnover up to a maximum of €20 million.

"There has been a lot more banging of drums with regards to cyber security," commented Stuart McDonald, Managing Director, Seric Systems, "and organisations are waking up to their responsibilities with regards to security governance and risk assessment. The GDPR is a primary driver of the move from 'box-ticking' compliance to demonstrable compliance." He noted that organisations are becoming more proactive, wherein they are looking at real-time analytics and monitoring of systems.

Yet more can still be done. McDonald says it starts with good governance. "It starts at the top. Generally speaking, not just in energy, there is not enough oversight of cyber security. For example, a finance director would be subject to the scrutiny of his peers, this is not the case for IT. It's compounded by a lack of parity for IT – IT typically doesn't have a permanent seat on the board. IT is often only seen as a potential cost or potential problem." This, he says, has to change.

Microgrids show the power of innovation

Microgrid technology is helping businesses to ensure power supply reliability while also boosting their green credentials. **Siân Crampsie**

Keeping factories up and running is no easy feat in markets where power supplies are unreliable, and end consumers are now turning to advanced technologies to keep their operations going in the event of power supply problems.

Microgrids are one such technology. More traditionally used for providing power to remote, off-grid locations and islands, microgrids are now finding a place in the industrial sector, where they can help businesses ensure uninterrupted power supplies while integrating renewable technologies.

Just one month ago ABB commissioned a microgrid at its own production facility in Johannesburg, South Africa. The installation – an innovative diesel-solar solution – is essential to ensuring stable and cost-effective continuity of power supply to the site, says Massimo Danieli, Managing Director of ABB's Grid Automation Business.

"The Longmeadow facility was experiencing up to one or two power cuts per day at the height of the country's power supply problems," says Danieli. "The facility had diesel generation in place to provide back up power but generators can take a few minutes to start up and this was not good for the equipment."

"We also had to take into account the cost of diesel oil, and began to look for alternative solutions. We ran a study and looked at the potential for solar generation… and adding microgrid technology to improve power security."

With 5000 m^2 of rooftop at the 96 000 m^2 Longmeadow plant, which also serves as ABB's South African headquarters, ABB was able to install a 750 kWp rooftop photovoltaic (PV) array.

The rooftop solar array is able to meet around 40 per cent of the Longmeadow site's energy needs and charges the 1 MVA/380 kWh PowerStore battery package, which includes lithium ion batteries, power converters and software.

The 'brain' of the microgrid system is ABB's Microgrid Plus, a distributed control system (DCS) designed to ensure efficient and reliable power flow management. The DCS aims to minimise the amount of grid electricity and diesel fuel consumed and optimise the use of renewable energy from the PV panels. It achieves this by controlling individual loads, network switches, generators and storage devices.

"The microgrid control technology balances power production and demand and maintains system stability when the grid is disconnected and it manages all the logic that optimises production," says Danieli.

In addition, ABB has deployed a cloud-based remote service system to undertake operations and maintenance of the microgrid.

During normal operation, the microgrid maximises the use of energy from the solar panels to run the Longmeadow site's operations and charge the PowerStore batteries. Additional energy requirements are drawn from the local grid. The battery system also performs the task of stabilising the power system against fluctuations in frequency and voltage by rapidly absorbing or injecting power with the help of the inverters and virtual generator software. The batteries therefore undergo several charging cycles per day.

In the event of a grid disturbance or outage, the control system isolates the microgrid from the main grid. Longmeadow facility's energy needs are then sourced from the PV panels and the battery system, with the site's four diesel generators making up for any shortfall once they start up.

ABB has installed over 30 microgrid installations worldwide across a diverse range of applications, but this is the first to demonstrate the use of a microgrid as a backup power solution for an industrial plant. "Such applications are set to become more frequent in the future because of the increased availability of renewable energy sources, fossil fuel price volatility and environmental concerns," adds Danieli.

Microgrid technology was originally applied in isolated grids such as villages in remote areas and islands, but it is versatile and can serve many applications, both isolated and as partially grid-connected solutions. One of its main benefits is that it enables the uptake of renewable generation alongside traditional backup power, such as diesel generators.

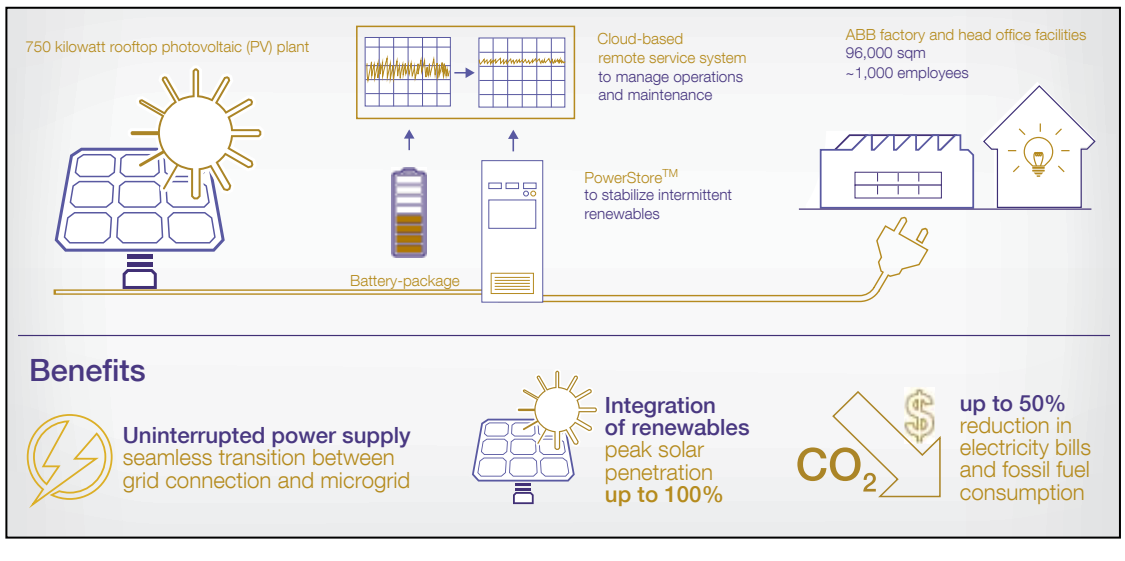
Firms considering the use of microgrid technology must consider a number of factors, including the cost of diesel fuel, which, in remote locations, is often determined largely by transport costs, says Danieli. Other factors that have to be considered include the availability and reliability of renewable energy resources and the cost of electricity from the grid.

Africa is a key market for ABB's microgrid technology because of industrial expansion, particularly in continuous process industries, and the firm also has its eye on India, where industrial firms also have the need for reliable back up power sources. Another "interesting" market is the USA, says Danieli, because of the need for grid resiliency and a drive for the uptake of local generation sources.

Research carried out by Navigant identified over 400 microgrid projects in operation or under development globally in 2013; the firm has forecast that the global annual microgrid capacity will increase from 685 MW in 2013 to more than 4000 MW by 2020.

The Longmeadow plant, with 5000 m² of rooftop at the 96 000 m², also serves as ABB's South African headquarters

ABB's microgrid solution in Johannesburg, South Africa is providing uninterrupted power supply and integrating renewables



Sp AusNet: In 2014 ABB installed a microgrid for SP AusNet in Australia, comprising a 1 MWh battery energy storage system coupled with a 1 MW diesel generator. The project is a pilot project and aims to demonstrate how microgrids can help improve stability to weak areas of a distribution grid.

Installed in Victoria, the battery system and smart inverter are the primary energy source, while the diesel generator acts as backup to extend the capacity available. The system complies with the distribution grid codes when grid connected, transitions into island mode when the network controller gives the command, and switches back to grid-connected operation without any power supply interruption.

Marble Bar: The world's first high-penetration, solar photovoltaic diesel power stations were commissioned in 2010 in Nullagine and Marble Bar, in Western Australia. The projects include more than 2000 solar modules and a solar tracking system that follows the path of the sun throughout the day.

PowerStore grid-stabilising technology and the Microgrid Plus power management solution ensure that the maximum solar energy goes into the network by lowering diesel generation down to the minimum acceptable level or switching it off completely. When the sun is obscured, PowerStore covers the loss of solar power generation as the Microgrid Plus system ramps up the diesel generation, ensuring the network has an uninterrupted energy supply.

The solar systems generate over 1 GWh of energy per year, supplying 60 per cent of the average daytime energy for both towns, saving 405 000 litres of fuel and 1100 t of greenhouse gas emissions each year.

Shaking up the world

Junior Isles

When the young Cassius Clay, who later changed his name to Muhammad Ali, captured the world heavyweight boxing title in dramatic fashion, he changed the course of both boxing and human rights for African Americans.

The recent passing of "The Greatest" was, as expected, global news of a scale rarely seen. But it was to be just the first of two huge news stories in what turned out to be a tumultuous month. As the world still mourned the loss of the best-known sportsman that ever lived, the British public, less expectedly, voted to leave the EU. And while the legacy of the man who "shook up the world" is clear, it is still too early to assess the full impact of the Brexit vote on both the EU and the UK.

What is certain, however, is that it will add to the disruptive effect that renewables, the transition to a low carbon economy and the move towards digitalisation are already having on Europe's utilities.

During the Annual Eurelectric Conference in Vilnius, Lithuania, in early June, the shaking up of the electricity sector saw the use of a term that is new to our industry. Antonio Mexia, Chief Executive Officer of EDP, and President of Eurelectric told delegates that the power industry is being "Uberised".

Mexia told delegates that the power sector is "undergoing rapid transformation fuelled by innovation, digitalisation as well as by political will and social trends" and stressed that "the electricity sector has to be at the front line" of this revolution.

It is expected that renewables will need to provide 50 per cent of the EU's electricity needs if it is to reach its 2030 emissions target. The move to an electricity infrastructure capable of handling a high penetration of renewables and balancing supply and consumption from distributed sources in the optimum way, presents both challenges and opportunities.

"Accelerating innovation in the EU power sector will be worth €70 billion by 2030," said Mexia. "The digital transformation of the sector is already under way. Smart grids are being deployed – at least 80 per cent of electricity customers in the EU should be equipped with smart meters by 2020. This translates into more than 200 million intelligent meters that will transmit user data closer to real-time."

Indeed distributed resources are already being managed through intelligent digital platforms. New digital products and services are being created and customer segmentation is now possible. Mexia noted, however, that utilities are not alone in the new energy space.

Competition is coming from all sides – from innovative start-ups, big telecoms and IT companies and utility customers themselves.

"Electricity was once a commodity over which consumers had little choice. Technology allows choice with regards to providers, use and storage of electricity… Utilities once were only asset managers, today the focus is clearly on customers and society," said Mexia.

"The biggest retailer today, Ali Baba; the biggest hotel chain, Airbnb; the biggest taxicab/vehicle hire company, Uber; none of them have assets. We have seen enormous change in a lot of industries and we need to see what is happening in our sector because, as someone recently told me, everybody will be Uberised."

The term 'Uberisation' comes from the company name Uber, which developed a mobile application that allows customers to submit a trip request, which is then routed to Uber drivers who use their own cars.

Uberisation refers to the use of computing platforms, such as mobile applications, to facilitate peer-to-peer transactions between clients and providers of a service, often bypassing the role of centrally planned corporations. Unlike a traditional business, the model has very low operating costs since the business does not own physical assets.

Serge Colle, EY's Power & Utilities Leader for Europe, Middle East, India and Africa, believes that Uberisation is coming. "Uberisation, or you could call it dis-intermediation, could happen really fast – probably faster than we expect but maybe slower than some hope for. Some [utilities] will respond successfully but others will not… I am confident there will be a stronger push [by utilities] to embrace the new digital world."

Dalius Misiunas, CEO of Lietuvos Energija and President of the Lithuanian energy association NLEA, also anticipates increased competition and integration as a result of digitisation. "It will make the integration of new players easier – I'm talking about prosumers, small-scale generators," he said.

Yet despite the threat, he also sees opportunity. Misiunas told delegates: "The digital change is affecting the entire energy value chain. From generation to customer relationship experience, there are opportunities that can bring additional value into our companies. Experience from other industries show these can be bigger than anticipated… [so] we should not be afraid of it."

He noted the digital transformation was not just about increased information or more efficient operations. "It will help us as an industry to be the main player in achieving a cleaner and more sustainable economy. It will give renewables a more convenient platform to participate in the wholesale market."

He stressed, however, that it is urgent to review business models and operations. "I don't know how many of you are thinking of the new strategy today but those of you who are looking forward should be doing that."

There is already evidence of this happening in the industry, and not just because of the changing electricity generation landscape.

Moody's said in a recently published report that lower commodity and power prices have prompted Centrica to accelerate its strategic shift away from electricity generation and oil and gas production toward "downstream" activities in energy retail, services and technology when commodity prices fell sharply in 2015 and early 2016.

The report said Centrica's future focus, as set out in its July 2015 strategy review, will be customer-facing supply, services and technology businesses, as well as "distributed generation" – managing or part-owning small-scale flexible generation which is able to profit from peaking prices.

Speaking on the sidelines of the Eurelectric conference, Colle commented on utilities' response to the disruptive changes in the market. He said: "I can easily imagine that some of the big corporate utilities will not exist in the same form as they are today. Some of them, such as E.On and RWE, are organising fundamental changes themselves already."

In the coming years utilities will probably focus on trying to protect, manage and optimise their asset base, while protecting balance sheets as much as possible. There will certainly be more investment in renewables or, as Colle put it, "risk-neutral" assets.

Energy transformation strategies was the topic of a conference organised by the *Financial Times* at the start of June. Viren Doshi, Global/EMEA Energy Consulting Lead, PwC noted: "The example that Uber has set can affect far more than we think."

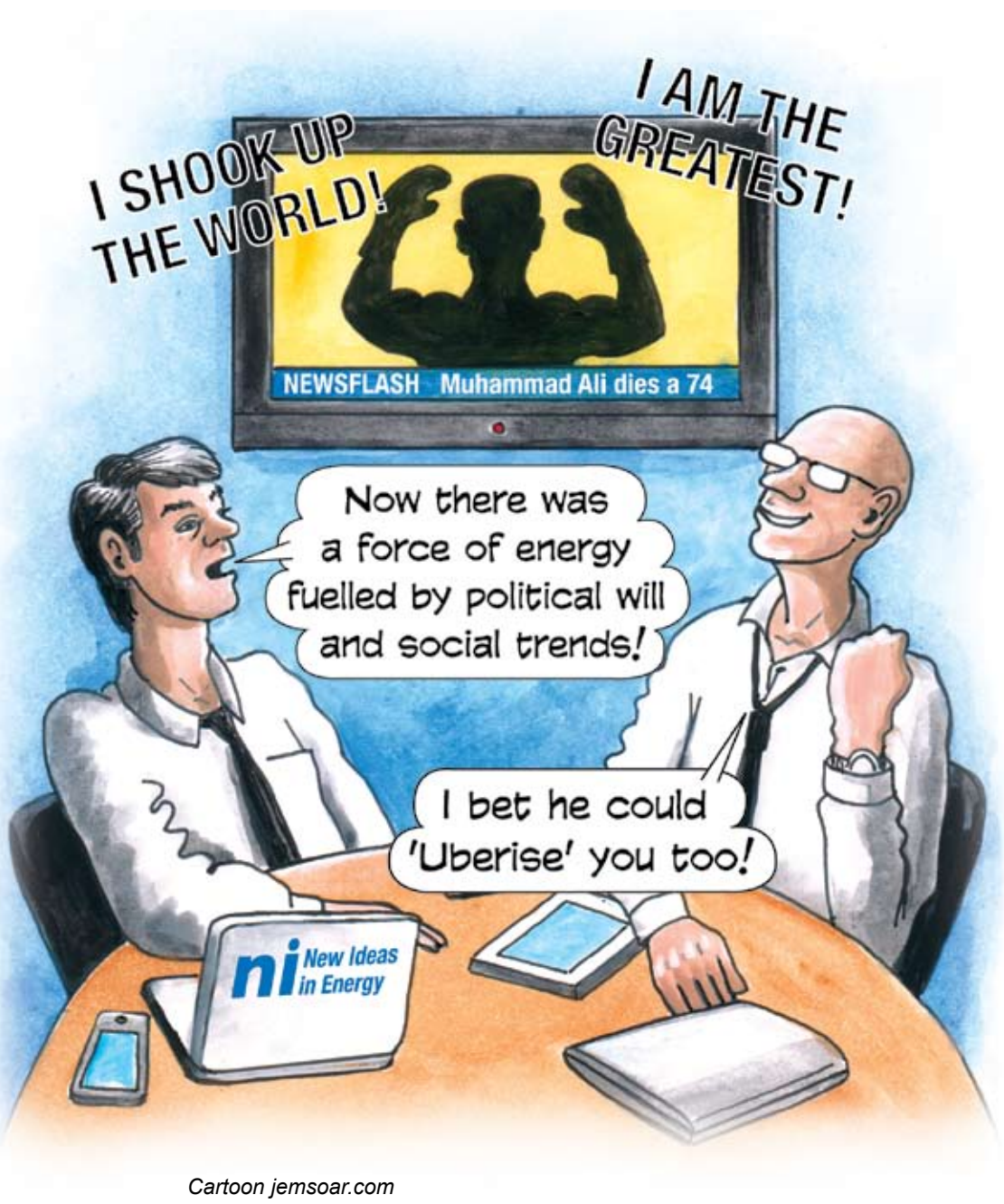
Speaking in the same session, Paul Gilding, addressed the question: will the fossil fuel industry transform and what is the evidence to suggest it is likely? Gilding, an independent writer and corporate adviser on sustainability, is the author of several books, one of which is called *The Great Disruption*. He argued that, in the face of climate change "it is pretty clear that if we don't transform dramatically and radically, we face economic collapse".

He said: "It's straightforward. We are going to move to a low carbon economy, the question is timing, technology and who will get us there: is it today's players or is it tomorrow's companies?"

Utilities in Europe have finally accepted that things are changing fast and most are open to a new way.

Closing the Eurelectric conference, Mexia said: "Today we are much more open to debate, much more open to controversy and different opinions… because the frontier between the [electricity] sector and other sectors is being blurred. Blurring of frontiers brings new minds and fresh ideas to the table."

Disruption is not always a bad thing. Ali was in many ways a disruptive force but we have all seen what he was able to achieve. Perhaps we could all learn a thing or two from the man simply known as *"The Greatest"*.



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