THE ENERGY INDUSTRY TIMES

April 2016 • Volume 9 • No 2 • Published monthly • ISSN 1757-7365 www.teitimes.com

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Problems mount at Hinkley C

Vincent de Rivaz: the project will "clearly and categorically" go ahead

Despite the promise of financial support from the French government and reassurances from EDF, the Hinkley Point C nuclear plant could once again face challenges surrounding European state aid rules. **Junior Isles**

The future of the proposed Hinkley Point C nuclear plant is far from certain despite the reassurances of EDF chief Vincent de Rivaz.

Mr de Rivaz recently told UK ministers that the project would "clearly and categorically" go ahead and insisted that a Final Investment Decision would be made in early May.

Hinkley Point C would be the UK's first nuclear plant in a generation but has faced delays largely due to difficulties in financing the £18 billion project. Despite a promise of £6 billion from Chinese company CGN and a generous tariff of £92.50/MWh over 35 years, there remain concerns over financing.

Giving evidence to the UK's Energy and Climate Change Committee, Mr de Rivaz said: "We are working on solutions, they're well identified, it's a complex issue. Everybody is working on the final stage to make it happen."

EDF said it has invested £2.4 billion so far on the project, which is running at £55 million a month. With such an investment, de Rivaz said "nobody should doubt" the company's commitment to the project.

Mr de Rivaz also referred to the comments of French Economy Minister Emmanuel Macron, who had earlier said "the project is absolutely critical and has the full support of the French Government".

In mid-March the French government indicated it could inject fresh capital into EDF to help it build the plant.

The move came in response to a letter from EDF's chief executive Jean-Bernard Lévy to staff warning it would not proceed with the project unless it secured additional help from the French state, which owns 85 per cent of the company.

Macron responded saying: "If there is a need to recapitalise, we will do so… If we need to forgo [EDF] dividends again, we will do so." He added: "We will all make an effort. The government as shareholder has started doing so."

Macron, however, did not mention the amount of financial support the French state could provide, nor the exact form it could take. There have been reports that state-owned bank Caisse des Dépôts might be asked to take a minority stake in Hinkley.

Support from the French government could, however, prove to be a stumbling block. The European Commission has already had to investigate whether the generous tariff the project will receive meets the rules on state aid.

Greenpeace Chief Scientist Doug Parr, who also gave evidence at the

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Commission to call for nuclear investments as dispute over German nuclear closures heats up

The European Commission is planning to call on European utility companies to make major investments in nuclear energy, according to German business and financial publication *Handelsblatt*.

The publication said it has seen a copy of a report soon to be released by the Commission on the state of the nuclear industry.

Handelsblatt stated: "The Commission estimated that to secure energy supply across the 28-nation bloc, investments of between €450 billion and €500 billion are needed in nuclear power by 2050." Of that, between €45 and €50 billion would go towards maintaining existing power stations. The remainder would be invested in building new plants.

The news comes at the height of an ongoing debate between a commission of experts on how to divide up the costs of Germany's multi-billion-euro nuclear cleanup between the utilities and the state.

Last month a high court battle kicked off between Germany's utilities and the government as the companies accused the state of expropriating their nuclear plants without paying compensation following the decision to pull the plug on nuclear power.

Meanwhile the nuclear commission is looking for a compromise that does not impose too great a financial burden on the power sector but is also a fair deal for German taxpayers. The commission's conclusion, expected in mid-April, could provide an important precedent for other European states that have not yet thought about how and where to dispose of their nuclear waste, and who should pay for it.

The outcome of the ongoing deliberation will be crucial to the already embattled E.On and RWE. Last month both companies announced huge losses for 2015.

E.On's €7 billion net loss was the largest in its history. RWE reported a net loss of €170 million for 2015 after €3 billion of impairments, mainly on its power generation assets. In February RWE took the decision to scrap its dividend, a move that has drawn complaints from its shareholders.

Rolf Martin Schmitz, Chief Operating Officer, however, was dismissive of the complaints saying, the municipal shareholders should "get real". He added: "We have distributed many billions in the last years – maybe even too many."

The German utility's crisis deepened last month when it reported a €137 million loss at its UK arm Npower and unveiled plans to cut more than a fifth of the unit's workforce.

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hearing said: "It has been said by many people that Hinkley is a pet project of this government, and of strategic importance to the French government. If the French government now gives a slab of cash to EDF to finance Hinkley, along with the UK government's direct and indirect financial and political support, it is likely that this project will fall foul of state aid competition laws and will be on very shaky ground to go ahead.

"There are a number of problems with the State Aid process, but at its centre it is an attempt to prevent governments from picking favourites and giving them an unfair advantage over other companies or a bad deal for the public."

Parr also said there was a need for transparency saying the government "could, at the very least, be upfront about what it's doing". He said: "Why do we have to take them to court to get the rationale for paying treble the current market cost of electricity and prioritising Hinkley above and beyond any other form of energy?"

The high tariff paid for electricity from Hinkley C has also come under fire from industry observers.

In an earlier hearing, Simon Taylor, Lecturer in Finance, Judge Business School at Cambridge University, said Hinkley offers "poor value for money". He added it is better if it is cancelled or renegotiated without jeopardising other nuclear projects. He told MPs: "They would love to receive £92.50/MWh but it doesn't mean they should get it."

Dr Taylor said that although he believes new nuclear cannot be funded without some form of government support, he was "surprised" by the European Commission's approval, adding the package is "quite generous".

EDF's board has been split for several months about whether to proceed. In February its Financial Director Thomas Piquemal suddenly resigned from his post warning that Hinkley Point could threaten the company's future. EDF borrows money every year to pay its dividend and its €37 billion of net debt far exceeds its €19 billion

Quit: EDF Financial Director Thomas Piquemal

market capitalisation.

Piquemal and his allies on the board, who include representatives from some of France's biggest trade unions, said the 66.5 per cent stake that EDF holds in the project was too big a burden. They argued for the plans to be put on ice until other investors could be found.

France's state audit body, the Cour des Comptes, also said that EDF should ask itself "serious questions" before pushing ahead.

EDF will be called back to be questioned at another government hearing if it fails to make a final investment decision by "early May", ECC Chair Angus MacNeil MSP said.

Greenhouse gas decoupling from economic growth, says IEA

Data released by the International Energy Agency (IEA) showing carbon emissions have stayed flat for a second year running, is further evidence that halting climate change does not have to be at the expense of economic growth.

According to IEA preliminary data for 2015, global emissions of carbon dioxide stood at 32.1 billion tonnes in 2015, having remained essentially flat since 2013.

The IEA preliminary data suggest that electricity generated by renewables played a critical role, having accounted for around 90 per cent of new electricity generation in 2015; wind alone produced more than half of new electricity generation.

In parallel, the global economy continued to grow by more than 3 per cent, offering further evidence that the link between economic growth and emissions growth is weakening.

The two largest emitters, China and the United States, both registered a decline in energy-related CO_2 in 2015. In China, emissions declined by 1.5 per cent, while in the US, emissions declined by 2 per cent.

"The new figures confirm last year's surprising but welcome news: we now have seen two straight years of greenhouse gas emissions decoupling from economic growth," said Fatih Birol, IEA Executive Director. "Coming just a few months after the landmark COP21 agreement in Paris, this is yet another boost to the global fight against climate change."

Commenting on the IEA's findings, Richard Black, director of UK-based Energy and Climate Intelligence Unit (ECIU), said: "When the IEA said last year that global emissions had stalled whilst economic growth had continued, they understandably sounded a note of caution; was this a one-off, or the start of something major?"

He added: "The sense of excitement as they report similar findings this year therefore is palpable, because in essence they're showing that combating climate change is perfectly compatible with continuing economic growth."

The IEA noted, however, that countries in Asia, the Middle East and Europe saw their emissions rise and Birol said lower coal and natural gas prices could spur some nations to stop supporting renewable energy as much as they have in the past.

China's new Five-Year Plan focuses on clean energy

- New targets for carbon and energy intensity
- Carbon dioxide emissions may have peaked already

Junior Isles

China's 13th Five-Year Plan, which will guide the country's economic and social development from 2016 through 2020, has clearly identified environmental stewardship as an integral component of the country's development.

The new plan unveiled in March sets high-level targets and policies that will continue to strengthen China's efforts to shift to a more sustainable model of growth and deliver on its climate commitments.

China plans to grow its economy by more than 6.5 per cent per year over the next five years. This growth will increasingly come from services, as opposed to carbon-intensive heavy industry and infrastructure. The shift will help China achieve its Paris Agreement pledge to reduce carbon intensity 60 to 65 per cent by 2030.

China also set a new target for an 18 per cent reduction in carbon-intensity from 2015 levels by 2020. It is estimated this will actually reduce its carbon intensity 48 per cent from 2005 levels by 2020, exceeding its original target of a 40-45 per cent reduction by that year.

For the first time, the plan includes quantified guidance on energy consumption control, stating that China should limit its energy use to 5 billion tons of standard coal equivalent in 2020.

The country will also continue to ramp up its deployment of renewables – a move that saw it become the global leader in solar power capacity last year. China's energy planning agencies aim to produce 200-300 GW of wind and 150 GW of solar energy by 2020.

At the same time it is reducing its coal use. The US Energy Information Administration estimates that coal consumption stayed flat in 2014, and the National Bureau of Statistics states production fell by 3.3 per cent last year.

China has already made substantial progress under the 12th Five-Year Plan, surpassing its targets for energy intensity (down 18.2 per cent) and carbon intensity (down 20 per cent), according to official figures.

Its Paris commitments include a target to peak carbon emissions in 2030 and to make best efforts to peak earlier.

A recent London School of Economics (LSE) paper published in the journal 'Climate Policy China' says carbon dioxide emissions are likely to peak by 2025 – and may even have done so already.

"The major problem with current models of China's emissions is that most of them do not pay attention to change in the structure and growth of China's economic output," said Fergus Green of the LSE's Grantham Research Institute, co-author of the study with Lord Stern of the LSE.

The new Five-Year Plan was unveiled just ahead of the Global Cleantech Summit. On the opening day of the Summit, Wang Yi, Member of the Standing Committee of the National People's Congress and Vice President of the Institute of Science and Development, Chinese Academy of Sciences said: "Green development is an important part of the construction of an ecological civilization, suggesting we should make the entire social economic system 'green' to establish a green production and consumption system in which systematic innovation, including technical, institutional, conceptual and innovative business models are pushed forward.

"This green development and environmental protection in China, the world's second largest economy, has been included in its strategy of achieving global sustainable development goals."

The Summit saw the launch of the 'Accelerator 100' project, led by The Climate Group and partners. The project is aimed at connecting 100 of the world's leading clean technology and energy companies with investors through the Summit.

China is one of the largest growth markets for cleantech in the world, and is already expected to reach $2.2 trillion by 2020.

Ansaldo, GE deal bears fruit

Following the closure of the deal between Italy's Ansaldo Energia and GE, the Italian company looks set to expand its global footprint.

In late February, GE said that it closed its transaction to divest select power generation assets to Ansaldo Energia. GE first announced the transaction in September 2015 when the European Commission and US Department of Justice approved GE's acquisition of Alstom's Power and Grid businesses on the condition that GE would commit to divesting segments of Alstom's heavy-duty gas turbine business, pending regulatory approvals.

Under the terms of the €120 million deal, GE has divested the following assets to Ansaldo Energia: Alstom's GT26 (an F-class gas turbine) product line for new unit sales; Alstom's GT36 technology development programme, which upon completion would result in an H-class gas turbine product; and services contracts for 34 GT26 units. The remainder of Alstom's gas turbine installed base (approximately 720 units) remains with GE.

In addition, to address concerns raised by the Department of Justice and European Commission regarding competition for the service of GE gas turbines, GE has divested Alstom's Power Systems Manufacturing (PSM) business, which provides after-market parts and services for other OEMs' equipment. GE will receive a license to the PSM intellectual property used to offer after-market services for non-GE gas turbines.

The deal is already bearing fruit for the newly formed Switzerland-based gas turbine manufacturer Ansaldo Energia Switzerland. The company recently won contracts worth around €600 million to supply the power island for two independent power projects (IPPs) to be set up in the Ibri and Sohar areas in the Sultanate of Oman. With a combined capacity of 3220 MW, the projects represent the single largest jointly procured power scheme to be undertaken in the Sultanate.

Equipment to be supplied by Ansaldo Energia for each power plant will include four of Ansaldo Energia's newly acquired advanced GT26 gas turbines, four heat recovery steam generators (HRSGs), two steam turbines and six turbo generators to the Chinese EPC contractor, Electric Power Construction Cooperation of China.

Its acquisition of Alstom's GT26 gas turbine technology gives Ansaldo Energia considerable leverage in serving the Omani and regional power generation industry.

Juerg Schmidli, Ansaldo Energia Switzerland President, commented: "With its operating flexibility and high efficiency, the GT26 gas turbine will play a critical role in generating maximum project returns for our customer. This is the perfect start for our newly formed company Ansaldo Energia Switzerland."

US, Canada pledge to cut methane emissions

The US government faces new threats of legal action after unveiling plans to curb emissions from the oil and gas sector.

Siân Crampsie

The governments of the USA and Canada say they will begin drawing up new regulations to cut emissions of methane from the oil and gas sector after signing a joint declaration on climate, energy and Arctic leadership.

The two countries have made a commitment to cut emissions of methane – a potent greenhouse gas – by 40-45 per cent below 2012 levels by 2025. The move was welcomed by environmental groups but criticised by the oil and gas industry, which warned of the impact of new regulations on economic growth.

The announcement is another part of US President Barack Obama's drive to make the USA a leader in global efforts to combat climate change. Signed by Obama and Canadian Prime Minister Justin Trudeau last month in Washington, D.C., the agreement also includes a commitment to implement the Paris Agreement on climate change and support global efforts on climate action.

"Canada is joining us in our aggressive goal to bring down methane emissions in the oil and gas sectors in both of our countries and, together, we're going to move swiftly to establish comprehensive standards to meet that goal," Obama said at a joint press conference with Trudeau.

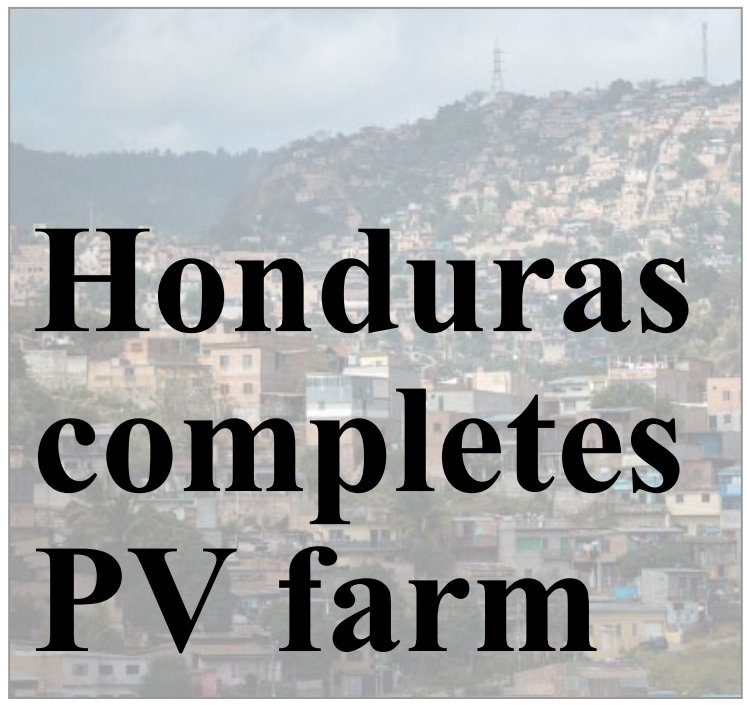
Gina McCarthy, administrator of the US Environmental Protection Agency (EPA), said it would start consulting with industry in April about sources of methane emissions and the technologies that can be used to reduce them. EPA and Environment and Climate Change Canada (ECCC) will also take measures to improve data collection, R&D efforts, and share knowledge of cost-effective methane reduction technologies.

Other initiatives under the agreement include an endorsement of the World Bank's Zero Routine Flaring by 2030 Initiative, bringing the number of governments endorsing the initiative to 18. Twenty oil companies and 11 development institutions have also signed up so far, according to Sustainable Energy for All (SE4All).

"This significant step by the United States and Canada is a major milestone in the push to stop a shockingly wasteful and polluting practice that simply doesn't need to happen," said Rachel Kyte, Special Representative of the UN Secretary-General and CEO of SE4All.

However the American Petroleum Institute said the new regulations could "put the shale revolution at risk" by raising costs and talking away cash that could otherwise be invested in production. It also said it would consider legal action to block new regulations.

Obama and Trudeau's agreement also includes pledges to cooperate on clean energy initiatives by phasing out fossil fuel subsidies, facilitating the integration of renewable energy, aligning energy efficiency standards and accelerating clean energy innovation.



Honduras completes PV farm

Honduras is now home to the Aura II solar farm

Isolux Corsan has completed construction of its first solar photovoltaic (PV) plant in Honduras.

The 61.5 MWp Aura II solar farm has received a certificate of project completion from Energía Cinco Estrellas S.A. de C.V. and has been called "the most efficient and best managed [power plant] in the region so far" by the Honduran electricity authority.

Aura II was built at a cost of $100 million in just seven months. Located in the region of Choluteca, it covers an area of 145 hectares and has more than 200 000 photovoltaic modules installed.

The project was financed by private investors from Mexico and Honduras, and by the International Finance Corporation (IFC), the Mexican bank Bancomext and the German development agency DEG.

The energy produced by the solar farm will be delivered to the National Electric Energy Company (ENEE) through the Santa Lucia substation under a 20-year power purchase agreement.

Towantic reaches financial close

A new combined cycle gas turbine (CCGT) power plant planned for northeastern USA and featuring GE's 7HA gas turbine technology has reached financial close.

Competitive Power Ventures (CPV) and GE Energy Financial Services said last month that the approximate $753 million debt financing for the 785 MW project was led by MUFG Union Bank, N.A., Credit Agricole Corporate and Investment Bank, and CIT Bank, N.A.

The CPV Towantic Energy Centre will be built in Oxford, western Connecticut, and will feature two GE 7HA heavy-duty gas turbines that offer fuel flexibility and fast ramping to complement nearby renewable energy resources.

Towantic was originally approved by the Connecticut Siting Council in 1999 as a 512 MW project, but was not built due to market conditions.

CPV and GE joined forces in 2012 to advance the project. In 2014, New England's grid operator announced the retirement of approximately ten per cent of the region's total electric generating capacity. With more retirements expected in the years to come Towantic is ideally suited to help meet the growing demand for capacity, CPV said. The plant will be able to meet the needs of about 800 000 US homes.

Peabody on the brink of bankruptcy

- Negotiations start with lenders
- Interest payment delayed

Coal giant Peabody Energy has warned that its financial path "may not be sustainable over the course of the year" and says that it has started negotiating with lenders over its debt obligations.

The US-based firm last month chose to delay interest payments due on loans and said that it may not have sufficient liquidity to continue as a going concern. The move signals that the company may have to file for bankruptcy protection, a strategy that would shield it from creditors while it underwent restructuring.

The company's financial difficulties are an indication of the pressures that energy companies engaged in the fossil fuel segment are facing: low energy prices, competition from renewables and low energy demand. Peabody's share price fell to $2.28 after making the announcement, having already fallen 50 per cent over the last three months and 97 per cent in the last year.

Peabody said that it chose to delay by 30 days a $71 million interest payment due in mid-March. "We plan to continue to use this time to have conversations with our lenders about our alternatives, while maintaining options around our interest payments," Peabody said in a statement.

It said that it is currently exploring "alternatives for other sources of capital" to meet its liquidity needs, adding that "there can be no assurance that our plan to improve our operating performance and financial position will be successful or that we will be able to obtain additional financing on commercially reasonable terms or at all.

"If we are not able to timely, successfully or efficiently implement the strategies that we are pursuing to improve our operating performance and financial position, obtain alternative sources of capital or otherwise meet our liquidity needs, we may need to voluntarily seek protection under Chapter 11 of the US Bankruptcy Code."

Last year Peabody rivals Patriot Coal and Arch Coal filed for bankruptcy protection.

Report rejects Asia coal boom

A new report says that predictions for building new coal fired plants in the region are wide of the mark. **Syed Ali**

Claims that Asia is on the verge of a huge expansion in coal burning for electricity generation are incorrect, says a new report.

The report, 'Asia's Tigers: Reconciling coal, climate and energy demand', argues that the Asian Tiger economies with the world's four biggest coal power project pipelines, China, India, Indonesia and Vietnam, are likely to build far less than half of their current planned coal plants.

The four "Asian Tigers" have 1824 plants either in planning or under construction – more than two-thirds of the world total. But the report concludes that the number actually built in the next five years will fall far short of 1000 plants, and is likely to be in the region of around 500.

The report's author, Gerard Wynn, consultant at GWG Energy, said: "These findings suggest that claims of an Asian coal boom that will derail climate change pledges made at the recent Paris summit are wide of the mark.

"In fact, the evidence suggests that the shift away from the dirtiest fossil fuels in favour of cleaner forms of energy is happening much faster than anyone could have expected.

One of the factors likely to constrain the number of coal plants built, says the report, is concern over air pollution in the four Asian nations, especially China and India. It said this is prompting governments to enact curbs on coal use, including India's carbon tax on coal.

Several recent announcements, however, appear to contradict the report's conclusions.

At the beginning of March India's Union power and coal minister Piyush Goyal said about $250 billion is expected to flow into the country's power and coal sector by end of the decade. He did, however, say there would be a four-fold increase in renewable energy by 2020, noting that "renewable energy is the future".

More recently, Bangladesh gave the green light for construction of the 1320 MW coal-fired power plant in Moheshkhali Island.

Vietnam is also continuing its pursuit of thermal generation. In late February Posco Energy signed a memorandum of understanding (MOU) with Nghe An provincial government to build a thermal power plant. It is the second coal fired power plant to be built by the South Korean company in Vietnam.

Also in late February, Pakistan signed a contract with China's state-owned Harbin Electric Corporation to build a coal fired power plant near Bin Qasim port in Karachi.

Nevertheless, Asia's appetite for coal fired plants is not being allowed to go unabated. At the end of February the World Bank (WB) said it would not give Myanmar any financial assistance to build coal fired power projects in spite of its increasing need for electricity.

India seeks nuclear cooperation

Eight years after the two countries initialled a historic civilian nuclear agreement, India and the US are believed to be close to finalising price negotiations to seal a deal between Nuclear Power Corporation of India Limited (NPCIL) and Toshiba-Westinghouse for six nuclear reactors.

According to a report in the *Hindustan Times*, Toshiba-Westinghouse made a formal "techno-commercial" offer to NPCIL and "uranium fuel offer" to the Department of Atomic Energy (DAE) in early March for the Mithi-Virdi 6000 MW power plant near Bhavnagar in Gujarat.

Quoting an official source, the newspaper said: "Both offers are under examination. The total capital cost as well as per unit power cost is under consideration. A US Exim Bank team is expected in India shortly for the financing package. The deal will be signed once these issues are sorted out."

The official said it was possible the deal could be signed during Prime Minister Narendra Modi's visit to Washington for the Fourth Nuclear Security Summit between March 31 and April 1.

"Commercial negotiations are on but it is not clear whether they can be closed by the time Prime Minister Modi reaches Washington," said the senior official.

India plans to treble its nuclear power capacity in the next 10 years.

■ China National Nuclear Corporation said it has set a target of building 30 nuclear power plants along the economic corridors of the new Silk Route, aiming to export its technology to countries of Central and South Asia, Middle East and even Europe.

Pakistan cooperates on clean energy

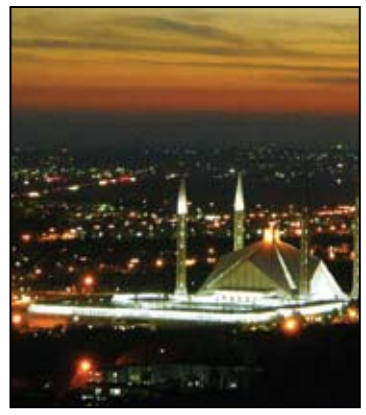
The German Ambassador to Pakistan confirmed that the two countries will collaborate on renewable energy and will establish a forum to enhance knowledge-sharing and cooperation between public and private sector stakeholders.

Germany will also assist with the formulation of policy and regulations to support the renewable power sector in Pakistan.

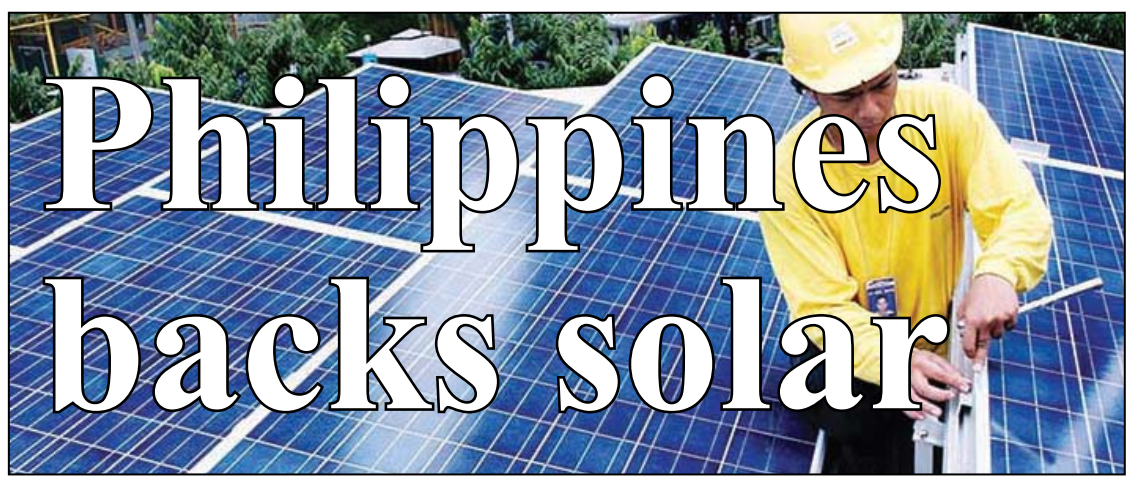
Pakistan has a largely untapped renewable energy potential but has only recently started attracting investments from international investors, mainly from China and Europe.

According to official estimates, investment in Pakistan's renewable energy sector is expected to reach $1 billion in 2016, with China providing about half of the total.

Foreign investors have committed over $3 billion into the renewables sector in Pakistan over the last year and the Alternative Energy Development Board recently stated that letters of interest have been issued for 25 solar power projects with a total potential capacity of 663 MW.



Islamabad: Pakistan's government will collaborate with Germany to promote renewables



Philippines backs solar

The Philippines is making headway in expanding its solar capacity, with a spate of activity ahead of the Department of Energy's (DOE) March 15th deadline to qualify for Feed-in Tariff (FIT) incentives.

Solar Philippines said it is now preparing to ramp up its generating capacity to 500 MW by 2017 after completing its major solar facility in Batangas.

"Solar has just begun to realise its potential. It will soon not only be cleaner, but cheaper and more reliable than coal, and in a matter of years, supply the majority of our country's energy needs," Solar Philippines CEO Leandro Leviste said during the launch of its 63.3 MW solar farm in Calatagan, Batangas.

The news came as the joint venture of AboitizPower and SunEdison Philippines Helios BV completed its 59 MW solar power project in Negros Occidental. The project, which is now exporting power to the Visayas grid, was completed at the end of February in time to receive a FIT rate of P8.69/kWh ($0.19/kWh).

It was the second project to be switched on in Negros Occidental within the space of a few days. A P10 billion, 132 MW solar farm in Cadiz, Negros Occidental, was switched on March 3, 2016.

The solar farm, which occupies over 176 hectares of land, is said to be the largest solar energy project in Southeast Asia, the fourth in Asia and seventh in the world.

The Philippines is committed to reducing its carbon emissions. In addition to building solar farms, the Department of Energy recently said it will tighten emission standards for coal fired power plants in a move to support its climate change mitigation programme.

Energy Secretary Zenaida Monsada said the agency is meeting with coal plant operators and generators for the imposition of strict standards on emissions and fuel quality.

"While we still allow coal plants, they should have the latest technology so emissions are much reduced," she said.

EU governments call for climate ambition

- Commission communication on Paris Agreement disappoints
- Financial sector assesses climate risk

Siân Crampsie

The UK has pledged to enshrine in law a long-term goal of reducing its carbon emissions to zero and has urged other nations to follow suit.

UK Energy Minister Andrea Leadsom told lawmakers in March: "The government believes that we will need to take the step of enshrining the Paris goal for net zero emissions in UK law. The question is not whether but how we do it."

Environmental groups welcomed the announcement, which came just days after the publication by the European Commission of a communication on the Paris Agreement. The UK, together with Germany, France, Austria, Belgium, Denmark, Greece, Luxembourg, Portugal, Slovakia and Sweden, called for the EU to ramp up its climate ambitions and retain its leadership role in the global climate movement.

Christian Aid called the European Commission's communiqué "disappointing". Mohamed Adow, Christian Aid's Senior Climate Change Advisor, said: "The EU has helped the world seal the Paris deal and it must now get its act together to increase its emissions cuts in line with the agreement. Otherwise it will undo its good efforts in helping the world arrive at the Paris Agreement, even before it has been ratified.

"The Paris Agreement was a watershed moment in the global journey to tackle climate change. The EU is acting like it never happened."

Last month Sweden pondered ambitious climate targets after a parliamentary committee submitted a proposal to become carbon neutral by 2045.

The proposed plan entails cutting domestic greenhouse gas emissions by 85 per cent over 1990 levels, and achieving the remaining 15 per cent cut by investing in international clean energy projects.

Sweden is already aiming to have zero net greenhouse gas emissions by 2050 and is also planning for its entire vehicle fleet to run on environmentally friendly fuels by 2030.

The UK's stance was timely as the country is preparing to finalise its fifth 'carbon budget'.

The UK's Committee on Climate Change concluded in January that the Paris deal, which contained a tougher temperature target than previously agreed, did not merit a change to the proposed fifth carbon budget, which must be implemented by June 2016. Environmental groups disagree, however.

"The announcement by Andrea Leadsom that the government would look to legislate a zero carbon target is a recognition that the UK can be at the forefront of a brave new low-carbon world," said WWF's Head of Climate and Energy, Emma Pinchbeck.

"We look forward to this promise being followed up with ambitious action. We will be campaigning to ensure this is consistent with [the] forward-looking commitment to a zero carbon future."

Governments are becoming increasingly aware of the risks associated with climate change.

In March De Nederlandsche Bank (DNB) called for more transparency on climate data, including detailed carbon footprint reports and energy transition plans to help financial institutions assess climate risks.

Likewise Finansinspektionen (FI), the Swedish Financial Supervisory Authority, submitted a report to government on how climate change may affect financial stability. It called on pension providers and financial sector to develop stress tests to capture risks to their portfolios from climate change.

Offshore wind costs falling

The costs of offshore wind energy fell during 2015 and are on track to reach £100/MWh by 2020, according to a new report.

The second annual Cost Reduction Monitoring Framework (CRMF) report, delivered by the Offshore Renewable Energy Catapult on behalf of the UK's Offshore Wind Programme Board, shows that investment in turbine technology has delivered significant cost benefits for project developers.

However, it says that further cost reductions are required, particularly in balance of plant technologies such as foundations, cables and substations.

The report outlines 13 cost reduction indicators, 12 of which are ahead or on target to meet milestones set. It also says that investment in research, development and industrialisation is required, and that this will only come with greater visibility of future rates of deployment and market size as the UK government sets out details of contracts for new offshore wind farms.

Last month the UK's Crown Estate announced agreements with offshore wind developers ScottishPower Renewables, Vattenfall and Dong Energy, which have reconfigured or identified new projects within their respective Round 3 offshore wind development zones in UK waters.

Since the award of zone agreements in 2009, developers have had exclusive rights to areas of UK seabed to

identify the best locations to develop large-scale offshore wind projects. With this appraisal phase now largely complete, developer focus is shifting to the development and delivery of the resulting projects.

ScottishPower Renewables says it will take forward two new projects: East Anglia Two and East Anglia One North, with a capacity of up to 800 MW each.

Vattenfall is taking forward two projects in the northern part of the previous East Anglia zone area, each with a target capacity of 1.8 GW.

DONG Energy has reconfigured its Hornsea Zone, resulting in three projects: Hornsea Project Two, Hornsea Project Three and Hornsea Project Four.

Sun shines on European solar

- Group calls for renewables ambition
- Germany, UK and France lead European solar market

European firms connected 8 GW of new solar energy capacity to the grid in 2015.

Industry group Solar Power Europe says that solar energy capacity in Europe grew by 15 per cent in 2015. Solar capacity in the region now stands at nearly 100 GW, it reported.

"2015 was an extremely successful year for solar and after three consecutive years of decline in Europe it is especially encouraging to see the sector grow again," said Oliver Schaefer, President of SolarPower Europe.

Three countries – the UK, Germany and France – led the growth last year, accounting for 75 per cent of the growth between them. For the second year in a row, the UK took first place with an estimated 3.7 GW.

On a global level, new solar power capacity increased by 25 per cent, or 50 GW in 2015. An estimated 228 GW of solar power is now installed in the world, up from 178 GW in 2014, said Solar Power Europe.

The two biggest markets are China and Japan, with the USA ranked third.

China not only added more than twice as much solar as Europe, it also exceeded 40 GW of total installed capacity, taking over the No. 1 spot from long-time leader Germany.

Last month Solar Power Europe called on the European Commission, Member States and European Parliament to show more ambition on renewables in light of the successful conclusion to COP21 in Paris.

Schaefer said: "Our Board has recognised that more ambition is needed in Europe to reach the objective of limiting global warming to just 1.5°C, which the European Union signed up to in Paris. We have therefore unanimously agreed to call for a renewable energy target of 35 per cent to be achieved by 2030.

"The European Union must review the targets suggested in 2014 in line with global developments, it would be foolish to pretend that nothing has changed since COP21."

OECD economies challenged by energy transition

- Complex energy systems make low carbon transition hard
- WEC survey highlights leaders' concerns

Siân Crampsie

A new report published by the World Economic Forum (WEF) suggests that developed countries are struggling to achieve a balance between economic growth and the need to build sustainable and resilient energy architecture.

In the fourth edition of its Global Energy Architecture Performance Index Report, WEF has highlighted energy security and access, and says that energy systems are being shaped by rapid developments in renewable energy, digital technology and international security.

The report provides an annual index with a benchmark to help countries address energy transformation challenges and identify opportunities across their energy systems. Although the top ten positions in the index are dominated by OECD countries, many of the large economies are not performing well on the index because the complexity of their energy systems means that the transition to clean, secure and affordable energy supplies is harder.

The WEF report echoes another recently published survey by the World Energy Council (WEC) showing that energy industry leaders are most concerned about risks associated with a shift to a low-carbon economy, innovation and commodity price volatility.

WEC surveyed over 1000 global energy leaders for its 2016 World Energy Issues Monitor. It says that post-Paris Agreement, the energy sector will enter a transition phase with powerful drivers influencing change and resulting in different ways of thinking about infrastructure and critical system components.

To navigate these transitions with limited resources defined by a sluggish growth context, investors and governments have to be very clear what their strengths and priorities are, WEC says.

Switzerland and Norway top the WEF index because of their well balanced energy systems. Following successful energy reforms, both Uruguay and Colombia have this year entered the top ten and are the only non-OECD countries in that position, WEF said.

Other non-OECD countries that have improved their performance include Indonesia, which has increased economic output per unit of energy used as well as reduced price distortions caused by government energy subsidies, Chile and Azerbaijan.

WEF says that with the exception of France, none of the world's 12 largest countries by GDP made it into the top 10 of the index, which measures the "energy triangle" of affordability, environmental sustainability, security and access.

Germany lies in 24th place because although its renewable energy capacity is considerable, its energy transition has seen sharp increases in electricity prices. The USA is in 48th place and has improved on energy access and security thanks to its shale gas revolution.

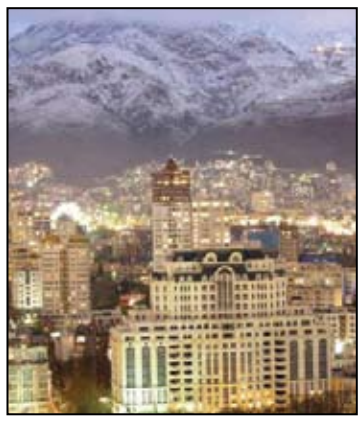
Japan is in 50th place and its performance in the index has fallen since 2009 because it continues to be affected after the Fukushima nuclear accident by the implications of high-costs energy imports, higher energy import dependence and increased CO_2 emissions.

The top ten economies in the WEF index are listed as Switzerland, Norway, Sweden, France, Denmark, Austria, Spain, Colombia, New Zealand and Uruguay.

Iran plans new capacity

International energy companies are looking to build new electricity generating capacity in Iran.

Iran's *Shana* news agency reported in March that investors from Turkey planned to build an 80 MW solar power plant in the central province of Alborz, while Italian firm Finergy is planning to build three solar farms in the country.



Tehran: International energy companies are looking to build new generating capacity in Iran

The 80 MW solar farm will be built at a cost of $60 million and will start operating within 18 months, according to Iranian officials. Finergy, meanwhile, is planning to build solar farms in the cities of Kerman, Yazd and Shiraz with a total capacity of 10 MW.

Iran wants to build 12 GW of renewable energy capacity by 2022, according to Iranian officials.

In February, Posco Energy Co., a unit of South Korean steelmaker Posco, said that it had signed a memorandum of understanding with Iranian steelmaker PKP to build a gas-fired power plant in the Middle Eastern country.

The 500 MW power plant will use byproducts from the steel-making process as fuel and will be built in Iran's Chabahar free economic zone.

Japan to finance Egyptian PV-battery project

Plans for the construction of a solar farm with battery storage in Egypt have moved forward after an announcement by the Japanese government that it would help fund the project.

Japan says it will offer a Yen10 billion loan ($88.4 million) to support construction of the plant, which would comprise a utility-scale photovoltaic (PV) solar farm and a battery storage facility with a capacity of up to 30 MW.

Egypt is expected to hold a tender for the battery technology in Japan, while Egyptian President Abdel-Fattah el-Sissi was expected to sign an agreement on the deal during a visit to Japan last month.

Egypt is intending to add 2 GW of solar capacity to its grid over the next few years with around 40 individual solar farms planned.

In late 2015, the EBRD allocated $500 million in funding for the country's solar programme, which will help the country to achieve its goal of sourcing 20 per cent of its energy from renewable sources by 2020.

China drives global hydropower growth

China accounted for over half of all new hydropower capacity added globally in 2015, continuing the trend of recent years.

The International Hydropower Association (IHA) says that 33 GW of new hydro capacity was added in 2015, including 2.5 GW of new pumped storage.

At the end of 2015, the world's total installed hydropower generating capacity reached 1211 GW, including 145 GW of pumped storage, IHA notes in its '2016 Key Trends in Hydropower' report.

The briefing identifies China's increasing global influence in the hydropower market, as well as increased activity in Africa.

In 2015, China's cumulative installed hydropower capacity reached 320 GW after it added 19.4 GW of capacity that year, according to the China Electricity Council. Chinese hydropower companies are becoming more active globally, with, for example, China Three Gorges Corporation purchasing concessions to operate two hydropower stations in Brazil totalling 5 GW to become the second largest private power generator in Brazil.

In Africa, key projects in Ethiopia, Guinea and the Democratic Republic of the Congo added to the continent's installed hydropower capacity. The Grand Ethiopian Renaissance Dam expects to commission its first two 375 MW turbines in 2016, while in Zambia, construction started in late 2015 on the 750 MW Kafue Gorge Lower project.

Other notable sector trends identified by the IHA include increased recognition of the value of electricity storage through hydropower, innovative financing options pioneered by the multilateral lenders, and the increasing influence of climate aspects on hydropower project design and rehabilitation.

Richard Taylor, chief executive of the IHA, said: "The latest data shows that the hydropower sector is continuing its strong growth trend across the world."

"The new Sustainable Development Goals and the Paris Agreement on climate action have emphasised hydropower's vital role in meeting the world's energy, water and climate challenges.

"Through its ability to support clean energy systems and provide multiple water services, hydropower can be the key to realising the ambitious global targets outlined at COP21."

Special Project Supplement

A window to the future

Careful planning and close cooperation between Siemens and Stadtwerke has seen the Block Fortuna combined heat and power plant in Düsseldorf start operation over two weeks ahead of schedule. The plant, with its glass-fronted building known as “the window to the city”, has broken several world records and shows investors and utilities what is possible with state-of-the-art technology. **Junior Isles**

The new Lausward Block F, or “Fortuna”, power station in the heart of Düsseldorf is the epitome of style and substance. Not only does the modern glass-fronted building surrounding part of the power plant strike an impressive pose in the city’s harbour area, the newly operational facility lays down three world-beating markers for the rest of the power industry to follow.

It has achieved a maximum electrical net output of 603.8 MW – a new record for a single combined cycle unit; set a new world record of 61.5 per cent for net power generating efficiency; and is the first plant to achieve the extraction of 300 MWth of thermal energy from a single unit in combined cycle operation.

The environmental benefits of this unparalleled performance are significant. When delivering both heat and power, Fortuna will have an overall fuel efficiency of about 85 per cent, reducing carbon dioxide (CO_2) emissions to a mere 230 g/kWh equivalent. Compared to an average coal fired power plant in the European Union, the new unit theoretically saves approximately 2.5 million tons of CO_2 annually. This corresponds to the amount of CO_2 emitted by 1.25 million passenger cars, each driving 15 000 km/year.

Located in the heart of the city, the ability to deliver both heat and power in the cleanest, most efficient and cost-effective way was of great importance to the plant’s owner, utility company Stadtwerke Düsseldorf (SWD) AG.

Fortuna represents a good example of the type of large gas fired power plant that can still make commercial sense in Germany’s challenging power generation market.

Since Germany began its “*Energiewende*”, or energy transition, – an accelerated drive to bring more wind and solar generation on to the grid – gas fired plants in particular have been hit hard. The country’s shift to heavily subsidised renewables – combined with unfavourable gas prices compared to coal, low carbon prices and a general slump in electricity demand across Europe – has seen gas fired power generation pushed down the merit order, leaving coal as the main replacement for nuclear for base load generation. Numerous combined cycle gas turbine (CCGT) plants have been mothballed or shut down as a consequence.

Lothar Balling, Head of Global Project Management, Siemens Energy Solutions, the turnkey supplier of Fortuna, noted: “There have been no new combined cycle plants built in Germany recently that do not produce both heat and power. All the new projects that are under construction or being licensed are all combined heat and power (CHP) projects, except for some potentially upcoming open cycle peaking plants.”

Like renewables, CHP is part of the EU’s policy of decarbonisation. Based on the EU Combined Heat and Power legislation, Germany introduced an improved CHP-legislation, the so-called KWK (Kraft-Wärme-Kopplung i.e. Combined Heat and Power) law, in 2009 and a further amendment in 2012. This was replaced on January 1, 2016 by the new CHP Act (CHP 2016).

This incentive supports energy companies in increasing the use and operating hours of such technology to support cleaner power generation and subsequent emission reduction.

Fortuna is one of only a handful of combined cycle CHP projects undertaken in Germany in recent times. Most recently, Vattenfall Europe Wärme AG selected Siemens as the general contractor to build a 260 MWe and 230 MWth gas fired combined cycle CHP plant in Berlin-Marzahn. The project is still going through the pre-engineering and approval process. With such projects few and far between in Germany, in the meantime all eyes are now on Fortuna.

Fortuna has come to fruition after several years in the making. Essentially, SWD was looking for state-of-the-art power plant technology to ensure its competitiveness in the market by increasing its share of self-produced electricity and producing district heating at lowest costs. On May 29, 2012, SWD awarded Siemens a contract after highly competitive bidding to build this new gas fired CHP unit.

As well as being responsible for full engineering, procurement and construction (EPC), Siemens also supplied the main plant components: an SGT5-8000H gas turbine, an SST5-5000 steam turbine, SGen5-3000W generator and a Benson heat recovery steam generator (HRSG) with an in-house design. The SPPA-T3000 instrumentation and control (I&C) system, transformers and other auxiliary systems from Siemens were also part of the total plant.

Balling recalled: “There was a

Turbine assembly: the SGT5-8000H has a four-stage turbine section and 13 compressor stages

competitive bid for the contract, which we won, and then we entered a joint cooperation with SWD. There was about one year of engineering and approvals etc. before construction of the plant kicked off in July 2013."

This, approximately, one year for approvals and engineering is seen as "good progress" for a plant being built under German legislation. "Nine to twelve months for approvals, etc., is pretty typical," said Balling. "This plant, in the heart of Düsseldorf was subject to a number of consents such as emissions, noise control and air pollution, etc. In parallel, Stadtwerke had to reinforce the cooling water and other common auxiliary system."

Close cooperation between Siemens and SWD was a big part of ensuring the smooth approval and planning process. Regular steering committee meetings between the Siemens and SWD teams ensured the project progressed without any hitches. The main planning and basic design was done during the bidding phase – ideas for the architectural design and specific design options came later.

"There were perhaps 120 small changes later but overall it was a very integrated approach where the planning was always done with the customer and approved by the customer. All the inspections of our equipment were carried out with the customer. Stadtwerke's CEO also visited our workshop," said Balling.

Timely delivery of large major components such as the gas turbine and steam turbine generator, which are on the critical path, was key to allowing Siemens to finish the plant over two weeks ahead of schedule. But perhaps the item that had the biggest impact on the project timeline was the HRSG, which was designed and delivered by Siemens in Vienna, Austria.

Balling commented: "There were other critical components such as steam turbine condenser, generator etc., but the HRSG was designed in our offices and was so totally under our control. The HRSG was designed early and critical to our success."

Executing the plant on time had its challenges, especially as Fortuna was built on a brownfield site with its existing infrastructure.

A unique feature of the Fortuna power plant is its connection to the local 110 kV HV grids. In order to distribute the plant's high electrical power into such a rather low voltage grid, Siemens connected the generator via two transformers to two separate 110 kV grids. It was another example of how to tailor-make a plant to local requirements.

The cooling water system called for special cooperation between Siemens and SWD. Balling explained: "The cooling water tie-in required cooperation between Stadtwerke and their sub-suppliers because we had to use the existing cooling water inlet system, which takes water from the harbour. We had to feed-in and tie-in to this existing cooling water system."

Sub-soil structures also required special attention. A flue gas desulphurisation (FGD) on part of the site meant piling was not possible in all areas and special preparation had to be made for the sub-soil.

With regards to the district heating system, an additional heat exchanger building, housing the heaters to meet the temperature and pressure requirements of the DH system, had to be added to the power train building.

Fortuna also had to be built on a very small site, with insufficient laydown area. "This," said Balling, "meant we had to do on-time delivery. For example, the gas turbine and steam turbine-generator went directly from the barges in the harbour via truck to be laid directly on their foundations."

He added: "In fact the laydown area was not actually on the site – it was across an active train line. We had cranes on both sides and equipment had to be transferred across the track."

But despite such a tricky working environment, the job was completed accident-free – 2.2 million working hours and 700 people on site at the peak of construction with no recordable incidents. "At Siemens we call this zero harm, and the credit goes to excellent project and site management" said Balling.

Apart from the heat extraction, Fortuna essentially has the same configuration used at the Ulrich Hartmann power station in Irsching, which previously held the world record of 60.75 per cent for combined cycle electrical efficiency. The gas turbine, generator and steam turbine are all arranged on a single shaft.

The SGT5-8000H is a single-shaft machine of single-casing design. It is the world's most powerful gas turbine in commercial operation, designed to deliver about 400 MW in simple cycle operation and over 600 MW in combined cycle operation.

Physically, the engine is the world's largest gas turbine, weighing 440 metric tonnes and measuring 13 m long by 5 m in diameter.

Its basic design, adopted from previous gas turbine models, includes: a disc-type rotor with central tie-bolt and radial serrations; two journal bearings and one thrust bearing; generator drive at the compressor intake end; and axial exhaust diffuser.

The turbine section of the machine has four stages with air-cooled blades and vanes on the first three stages, and thermal barrier coatings on the first and second stages. Stage-four is uncooled.

The use of air-cooling in the gas turbine as opposed to steam offers much faster start-up and greater plant flexibility because it means the gas turbine cooling system is decoupled from the water/steam cycle. With a steam-cooled machine, steam quality has to be strictly controlled, which becomes more difficult as more complicated condensing and heat exchanging equipment is introduced into the water steam cycle.

The gas turbine has 13 compressor stages operating at a pressure ratio of 19.2:1 and has a nominal base load inlet mass flow of 800 kg/s at ISO conditions. It has four inlet guide vanes, which further increases its operational flexibility.

The fuel gas burner system has five stages, two of which are pilots to control NOx. The combustion system consists of 16 low-NOx burners and baskets with air-cooled transitions. A can-annular combustor arrangement provides excellent uniformity of exhaust-gas temperature field. The result is significantly reduced emissions per kWh, which is especially important in an urban environment like the city of Düsseldorf.

Operating flexibility is a key aspect of Block Fortuna. A major contributor to the unit's high level of flexibility is a specially designed HRSG. The H-class HRSG is based on the proven Siemens Benson HRSG design but sets a new benchmark, exceeding F-class HRSG technology in all aspects. Compared to the F-class HRSG, the steam temperature and pressure are significantly higher, while steam mass flow has been increased.

Benson technology avoids the use of a thick-walled, slow warming HP drum. When combined with the 8000H gas turbine, it also enables fast start times compared with conventional combined cycle plants. The plant is designed to reach full load in less than 30 minutes from a hot start.

Steam from the boiler flows to an SST5-5000 steam turbine, which consists of a combined high- and intermediate-pressure casing (HP-IP) and a double-flow low-pressure (LP) section. These two turbines are coupled on one shaft and the steam will be guided from the IP turbines exhaust via a crossover pipe to the LP section.

Steam in the steam turbine HP section has a temperature of 600°C and pressure of 170 bar, IP steam is 600°C/36 bar and LP steam is 245°C/5 bar.

The maximum 300 MWth of heat that can be extracted from the plant, is about 75 per cent of the maximum district heating demand of Düsseldorf. No further auxiliaries such as duct firing are needed to achieve this outstanding performance.

Fortuna's impressive performance is largely attributable to the steam turbine design, which uses sophisticated, three-stage steam extraction especially adopted for this project.

By using these steam extraction points, increased fuel utilisation and reduced power loss factor for district heating applications can be achieved. The power loss factor is as low as 0.16 for the important load case of 150 MWth district heating.

This is due to the fact that the multiple steam extraction can be fine-tuned to account for the most important load cases. The extraction stages correspond to steam extraction points within the water-steam-cycle of the power plant.

The plant's flexibility means it can

The turbine being transported to Düsseldorf by barge

Special Project Supplement

Installation of the SGT5-8000H gas turbine at Fortuna

be operated in different modes if necessary – either in full district heating mode, as would likely be the case during winter, or in fully flexible condensing mode, for example during summer. Decoupling the heat from power generation is simply achieved by decreasing the district heat water flow so all the steam flows directly into the steam turbine.

The maximum 300 MWth heat output can be provided with 540 MWe, and 150 MWth is still possible with as much as 575 MWe of power.

If operated in power-only mode, the unit's fast start-up and ramping capabilities mean it could potentially also provide frequency and grid support.

The technical design and resulting record-breaking performance are impressive but the visual design is also outstanding. Called the "window to the city", the building with its glass façade is described by Balling as a "visual masterpiece".

"Providing this high functionality with such artistic design was not without its challenges in design and erection," Balling said.

He added: "You have to ensure that e.g. birds don't fly into the glass façade. We also had to incorporate ventilation into the building as well as a complex fire fighting system. The glass building also has an observation platform for visitors so we had to ensure it is very safe and allows access also for disabled persons. We also had to make sure, that low noise emissions come from the building, especially to the adjacent housing community and a hospital across the river."

Despite the challenges of constructing this work of art, the plant was handed over 19 days ahead of schedule. This was including incorporating a design change to include a new low load and low emissions concept.

Siemens notes that Fortuna demonstrates, for the first time that its H-class power plant can run at less than 35 per cent load with impressive emissions figures. Siemens points out that the plant load can be turned down to about 200 MW while achieving less than 25 ppm NOx and less than 60 ppm CO.

Balling noted: "We are working with the customer to reduce these numbers further, as we see potential in more markets. We have a warranty period now for the next two years, followed by a service agreement during which we can make further operational improvements."

During commissioning the plant was fully put through its paces. "We did all sorts of tests," said Balling. "We ran the plant up and down – doing dynamic tests and high load ramp tests in view of the need to respond to rapidly fluctuating systems caused by the sudden drop-off in wind or solar power generation."

According to Siemens, in such configuration plants achieve a start-up time of 25 minutes from an overnight shutdown to full load and a ramp rate of 55 MW/min in combined cycle.

Reliability and performance test runs, optimisation, modifications for the emissions system, etc., began in mid-2015 and were completed in January this year. Commissioning began with first firing of the gas turbine and was followed three weeks later by steam turbine commissioning.

Since the start of commercial operation on January 22nd, Fortuna has been operating in CHP mode.

"The operation in the first weeks was mainly start-stop," recalled Balling, "so they started in the morning and shutdown at night. But with the cold weather, in the last weeks it has been running for maximum heat output, where it is run at minimum load at night and back up to full load during the day. So the plant is really being operated over the whole range."

Improved operational flexibility along with record-breaking efficiency shows that Siemens is continuing to push the envelope in terms of the capabilities of combined cycle power plants.

Balling noted: "We are happy and proud to have broken the efficiency record for a second time, having achieved more than 60.75 per cent at Irsching. Nobody has so far come close to having a plant in operation that reaches these levels of efficiency. We are curious to see how the competition is following."

The plant, says Siemens, will be used as a showcase for German as well as international visitors. "There have been many visitors from Egypt, North Africa, Asia and more international parties will go to Düsseldorf to see the record-breaking Fortuna plant in operation" said Balling.

For SWD, apart from its importance from a commercial perspective, Fortuna is a fitting tribute to its 150-year anniversary and shows how a plant can be part of the stunning architecture that lines Düsseldorf's so-called Media Harbour.

Fortuna could also have an impact on the wider industry, possibly triggering new ideas for investors looking at CHP plant. Balling noted: "A small CHP plant can never achieve such high efficiency in condensing mode – you have to balance size against efficiency. But Fortuna shows that you can have a plant capable of delivering in the range from about 200-600 MW and supplying heat at high electrical efficiency. It could be a model for other projects."

Fortuna is one of a growing number of projects using Siemens H-class turbines. Latest figures show that 76 machines have been ordered since its introduction – 19 of these are in commercial operation. Since introducing this turbine to the market in 2010, Siemens has sold 39 machines in the 50 Hz market worldwide and the fleet has passed 200 000 operating hours (status February 2016).

The largest single order to date for the SGT5-8000H turbine has come from Egypt, where a total of 24 H-class engines are being installed in the Beni Suef, Burullus, and New Capital power plant projects. Siemens has also sold 37 turbines worldwide in the 60 Hz market.

But when considering the three world records, plant flexibility, low emissions, the close cooperation and happiness of the customer, zero harm during construction and impressive architecture, it is easy to see why Fortuna stands out from the crowd.

Balling said overall it was "flawless" in terms of design and execution. He summed up: "It is another masterpiece after Irsching, that demonstrates our capability as an OEM in the turnkey business and is internally and externally a demonstration of *Ingenuity for Life*."

The new Fortuna power station in the heart of Düsseldorf, with its glass façade, is described as a "visual masterpiece"

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siemens.com/fortuna

Abengoa outlines funding plans

Abengoa has secured a €137 million loan to keep it afloat as it tries to stave off bankruptcy.

The troubled Spanish engineering group is working to gain the support of the majority of its creditors for its restructuring plan, which must be approved by a judge and finalised by the end of March.

The emergency loan was a sign that the company's creditors were supportive of its proposed plans, according to analysts. Reports last month indicated that the firm had managed to secure the backing of 40 per cent of its creditors.

Abengoa needs to secure backing from 75 per cent of its creditors for its restructuring plan, which would see existing holders of its debt take a 70 per cent 'haircut' – or loss – in return for 35 per cent of the group's equity.

If the plan is accepted by a majority of Abengoa's lenders, it will allow the company to reduce its debt burden – excluding some factors such as project finance – to €4.9 billion from €9.3 billion at present. That would make the company's capital structure more sustainable, according to ratings agency Moody's.

In March Abengoa also outlined a proposed new funding initiative under which it would receive between

€1.5 billion and €1.8 billion in new money from its bondholders and bank creditors for a maximum term of five years.

In exchange for providing these funds, the bondholders and bank creditors – which include Banco Santander, Caixabank, Crédit Agricole, and HSBC – would own 55 per cent of Abengoa.

Abengoa filed a four-month pre-insolvency plan in November 2015 after an investor cancelled plans to inject €350 million into the firm.

Final court approval of the restructuring plan was due by 28 March 2016.

China and Goldwind lead global wind rankings

Strong growth in the Chinese wind energy sector has enabled Goldwind to displace Vestas from its number one spot in the rankings of global wind turbine manufacturers.

Siân Crampsie

Analysis of the global wind turbine market in 2015 has put Chinese firm Goldwind at the top of the world manufacturers' rankings for the first time ever.

Research from both FTI Intelligence and IHS Energy shows that Goldwind overtook Vestas as the world's largest producer of wind turbines in 2015, with 7.73 GW installed. GE rose to third place, displacing Siemens, thanks to its acquisition of Alstom.

Goldwind's rise to the top of the rankings of wind turbine OEMs reflects the extraordinary growth seen in the Chinese wind market in 2015, with over 30 GW of installations. Total global installations in 2015 were over 63 GW, according to FTI Intelligence.

The USA and Germany were the second and third largest markets in the world last year with wind new builds of 8.3 GW and 4.9 GW, respectively. While Goldwind captured over 12 per cent of global installations, less than three per cent of the firm's installed capacity in 2015 was in markets outside China, underlining its dependence of its domestic market.

Vestas captured 12 per cent of the global market and GE nine per cent, IHS said. It added that Siemens bolstered its leadership in offshore wind with installations in the UK and Germany totalling nearly 2 GW, or approximately 75 per cent of the global offshore wind market.

IHS Energy expects Europe and China to represent two disparate offshore wind turbine markets, with Siemens and Chinese vendors competing in their respective markets for global leadership in 2016.

China's cumulative connected wind capacity increased to 129 GW at the end of 2015, representing 8.6 per cent of the country's total installed power capacity. Goldwind recently said that it had successfully leveraged this growth to achieve its best performance in the 18 years since its establishment.

In 2015 Goldwind's revenue from operations increased 69.8 per cent to CNY30.1 billion ($4.63 billion), while operating profit increased 48.7 per cent to CNY3.1 billion.

The company's total assets were CNY52.6 billion, a 14.95 per cent rise year-on-year.

According to GlobalData, planned adjustments to the wind energy feed-in tariff in China boosted development in the sector. Ankit Mathur, GlobalData's Practice Head for Power, said: "Other companies have also been benefitting from the increased interest in wind power, and are not far behind Goldwind in terms of installations. Vestas installed 7.35 GW in 2015, and its revenues increased by 22 per cent when compared to 2014, leaving it ranked highly in second place despite being knocked off the top spot.

"The company's increased activity levels and earnings were due to the steady implementation of wind turbine and servicing order books that witnessed continuous growth because of favourable market environment. A strong global footprint also enabled the company to attain profitability in both mature and emerging markets."

FTI notes that five Chinese companies are in the top 10 global ranking, with rising star CSIC Haizhuang moving into the top 10 for the first time. Long standing top 10 supplier, Suzlon, dropped out of the top ten due to the sale of its subsidiary Senvion to Centerbridge Partners in January 2015.

E.On sets out investment plans

E.On says it will focus its 2016 renewable energy investments on offshore wind in Europe and onshore wind in the USA.

The German energy firm outlined its 2016 investment plans in its annual results presentation last month. It set out investments of €4.5 billion, of which €1.5 billion will be dedicated to renewables. This compares to renewables investment of €1.2 billion in 2014 and €1.1 billion in 2015, which also focused on offshore wind in Europe.

Last year E.On separated its business into two operationally independent companies with one, Uniper, focusing on renewable energy, networks and energy services. Announcing the company's 2015 annual results, CEO Johannes Teyssen said: "We posted solid operating results in a very difficult market environment. Our strategy of having E.On and Uniper focus on their respective energy world is the right response to this transformation.

"But the course ahead will be tougher and longer than anticipated."

Overall, the company posted an EBITDA of €7.6 billion (€8.4 billion in 2014), and a net loss of €6.4 billion (€3.1 billion in 2014). The substantial net loss is due to significant impairment charges, E.On said.

E.On's renewables business recorded an EBITDA of €1.3 billion in 2015, compared to €1.5 billion in the previous year. The company said it expects that renewables' 2016 EBITDA will be slightly below the prior year.

"We're the world's second largest offshore wind company and have a well-deserved reputation for excellence in planning, building, and operating offshore assets. This makes us a sought-after partner for companies that want to invest in green energy," said Teyssen.

In 2015, two new E.On offshore wind farms, Amrumbank West and Humber Gateway, entered service. The company also passed a resolution to move forward with the construction of the Rampion offshore wind farm.

Because of a further deterioration in the trading environment, E.On said that it would subject its assumptions on the future development of E.On and Uniper to a critical review. The difficult market environment will cause free cash flow to be below earlier assumptions, and future investments and dividends would have to reflect this, E.On said.

E.On is hoping shareholders will approve the spin-off of Uniper at the firm's AGM in June, after which it will seek a stock market listing

E.On focuses on offshore wind

Americas

Honduras orders propane power plant

Honduran electric utility Roatan Electric Company (RECO) has placed an order with Finland's Wärtsilä for the supply of a 28 MW power plant fuelled by propane.

Under a fast-track, turnkey contract, Wärtsilä will supply four of its 34SG-LPG engines to help RECO boost power supplies and improve power system reliability in its service territory. The new plant will also help RECO to keep down energy costs for consumers, it said.

"The infrastructure for importing, storing and handling propane is relatively simple and inexpensive. This makes propane an attractive solution for the Caribbean islands and other locations with no access to natural gas pipelines," said Sampo Suvisaari, Regional Director at Wärtsilä Energy Solutions.

This is the second propane-fired power plant supplied by Wärtsilä within a year.

MHPSA wins Kings Mountain order

NTE Energy has selected Mitsubishi Hitachi Power Systems Americas, Inc. (MHPSA) to supply an M501GAC gas turbine for the Kings Mountain Energy Center in Cleveland County, North Carolina, USA.

The 475 MW combined cycle power plant will be constructed, owned and operated by NTE's affiliate, NTE Carolinas LLC. It is scheduled to be completed and commercially online in 2018.

Asia-Pacific

CG wins PLN order

Avantha Group Company CG has won an order worth $35 million from PT PLN (Persero), the state-owned electricity company of Indonesia, to manufacture and install 28 power transformers across the firm's transmission network.

CG will provide power transformers ranging from 83.3 MVA to 167 MVA and rated voltage 500 kV/150 kV and install them in multiple substations and power plants in the Java, Sumatra and Kalimantan provinces.

The order is part of a project funded by PLN to enhance the performance of the Indonesian transmission grid.

EVN signs EPC deal

An engineering, procurement and construction (EPC) contract for the expansion of the Vinh Tan 4 thermal power plant at the Vinh Tan Power Centre in Vietnam has been signed between Electricity of Vietnam (EVN) and four contractors.

The $1.1 billion expansion project will be carried out by Doosan Heavy Industries and Construction, Mitsubishi Corporation, Power Engineering and Consulting 2 JSC and Pacific Ocean Engineering JSC.

The 600 MW plant will start operating at the end of 2019. Construction will start in the first quarter of this year.

Qinous delivers battery system

Qinous has won an international tender process to supply the battery system for a diesel-PV-battery hybrid project in an Aboriginal community in northern Australia.

The 800 kW/1987 kWh lithium-ion battery system will store excess solar energy and also provide the grid-forming functions of the diesel generators, which so far were the single source of power of the Daly River community. Power and Water Corporation, the local energy provider, commissioned the construction of the hybrid system.

"The operation of diesel generators is not only expensive for Power and Water, but is also a burden for the environment because of air pollution and spill risks," said Steffen Heinrich, Technical Director at Qinous.

"By temporarily storing excess energy as well as managing and stabilising the grid, our system allows the diesel generators to be switched off completely during the day. This leads to an increase of renewable energies in hybrid systems, and ensures the supply of affordable and clean energy in the community."

B&W boiler to expand Masinloc

POSCO Engineering and Construction Co. Ltd. has awarded B&W a contract to engineer and supply the coal-fired boiler for a project to expand the Masinloc power plant in the Philippines.

B&W's scope includes the supply of one 300 MW spiral-wound universal pressure supercritical boiler and auxiliary equipment.

B&W intends to perform engineering, procurement and fabrication activities at its joint venture facility, Thermax Babcock & Wilcox Energy Solutions Private Limited, in Pune, India.

Project completion is scheduled for early 2019.

Europe

ABB to enable digital substation

SP Energy Networks has selected ABB to participate in the Future Intelligent Transmission NEtwork Sub-Station (Fitness) project, an initiative to demonstrate digital substation technology in the transmission network in Scotland.

The Fitness project will see two bays of the existing Wishaw 275 kV substation in Scotland being equipped with new fully integrated digital protection and control systems, which will also enable improved system visibility, diagnostics and operation. This area is of special interest as large quantities of wind power could be integrated into the grid.

ABB will deliver a suite of digital substation components, including IEDs, non-conventional instrument transformers, merging units, and phasor measurement units that are interfaced with the IEC 61850-9-2 process bus architecture and with the wide area monitoring platform.

Dong Energy orders Race Bank cables

Dong Energy has placed contracts with three different UK companies for the array cables at its 580 MW Race Bank offshore wind farm.

JDR will supply the array cables for Race Bank, while DeepOcean will install the cables. Tekmar will provide the cable protection system.

The production of the array cables is underway and installation is expected to start later this year. The whole array cable system should be completed by mid-2017.

Race Bank is located almost 27 miles off Blakeney Point on the North Norfolk Coast, and a similar distance from the Lincolnshire coast at Chapel St. Leonards. It will consist of over ninety 6 MW wind turbines, with Siemens Wind Power chosen as the preferred supplier for the delivery of these turbines.

EnBW awards Hohe See substation contract

The FICG consortium of Cofely Fabricom, Iemants and CG has been awarded a contract for the EnBW Hohe See offshore wind farm in the North Sea. The consortium will design, supply and install the complete offshore substation for the German utility EnBW.

The EnBW Hohe See wind farm will comprise 71 wind turbines with a total capacity of 497 MW. It covers an area of about 40 km^2 in the German exclusive economic zone of the North Sea, 90 km north of Borkum and 100 km northwest of Helgoland, with water depths of up to 39 m. The wind farm will be connected to the German high voltage grid via the BorWin3 converter platform.

The EnBW Hohe See wind farm is the biggest planned offshore wind project in Germany.

HVDC Light will boost renewables integration

ABB has received an order worth around $140 million from transmission system operators Energinet.dk in Denmark and 50Hertz Transmission in Germany to design, supply and install an HVDC (high voltage direct current) converter station in Bentwisch, Northern Germany.

The HVDC Light "back-to-back" converter station, the first of its kind in Europe, will allow the connection of the asynchronous AC power grids of Eastern Denmark and Germany. The project is a key part of the Kriegers Flak combined grid solution project, which will establish the world's first offshore grid.

The 400 MW interconnector project will be co-financed by the European Union. In addition to allowing the integration of more renewable energy into the grid, the interconnector project will provide enhanced power security and offer additional opportunities for energy trading.

Siemens wins Nemo link contract

Siemens is to supply eight converter transformers for the Nemo Link project, a high-voltage direct current (HVDC) transmission system connecting Belgium and Great Britain.

The scope of supply comprises eight transformers, each with a power rating of 365 MVA. The value of the contract is over €32 million, Siemens said.

Commercial operation of the link, which is being developed by the UK's National Grid and Belgium's Elia, is scheduled for 2019.

International

ABB to support Iraq power infrastructure

Mass Global Holding has placed an order with ABB for the delivery of a gas-insulated switchgear (GIS) substation that will help integrate 3000 MW of generating capacity into the grid.

ABB will be responsible for the design, engineering, supply, installation and commissioning of the transmission and distribution substation excluding civil works. This will be the largest 400/132 kV substation in Iraq equipped with state-of-the-art gas-insulated switchgear, and will enhance operational reliability, efficiency and safety while minimising substation footprint and maintenance requirements.

ABB will also deliver two 400/132 kV autotransformers to step down the voltage for distribution, and advanced IEC 61850-compliant open automation, protection and telecommunication systems for local and remote control and monitoring of substation assets.

Marubeni wins Tavan Tolgoi tender

Japan's Marubeni Corporation has won the Tavan Tolgoi Power Plant project tender, according to the Mongolian government website.

The Tavan Tolgoi power plant project committee met on 28 February and selected Marubeni to undertake investment in the power plant. The selection process was monitored by Deloitte.

The government decided to build a power plant adjacent to Mongolia's biggest coal mine, Tavan Tolgoi, in 2013 and formed a project team. The project team says that they have completed over 20 studies and 15 draft contracts for the Tavan Tolgoi project, including a pre-feasibility study, and studies of the mine's deposit, water reserves, air quality, location, power lines, and pipelines.

The power plant will be built adjacent to Tavan Tolgoi, southern Mongolia, one of the world's largest untapped coking and thermal coal deposits.

Oman selects Mitsui consortium

An international consortium comprising Mitsui & Co. Ltd., International Company for Water and Power (ACWA Power) and Dhofar International Development & Investment Holding Co. (DIDIC) has been awarded a contract to build the 3219 MW Ibri-Sohar3 power project in Oman.

The project will be owned and operated by the consortium, with Mitsui as the lead investor with a 50.1 per cent shareholding. It involves the construction of two natural gas-fired combined cycle power plants – a 1450 MW plant at Ibri in Dhahirah governorate and a 1700 MW plant in the Sohar industrial port.

Commercial operation dates are January 2019 for Sohar-3 and April 2019 for Ibri.

First Solar modules to power Namibian PV plant

HopSol AG has selected First Solar's high performance thin film modules to power the Otjozondjupa solar park, near Grootfontein, Namibia.

When completed in June 2016, the 5 MW facility will be Namibia's largest grid-connected solar PV plant and is expected to account for approximately one per cent of the country's total generation capacity.

The utility-scale project is being developed by HopSol Africa and will comprise over 52 000 First Solar modules. It will provide power to state-owned utility NamPower.

The facility will utilise single-axis tracking technology to maximise energy yield. Namibia has an installed capacity of approximately 430 MW and imports over half of its power from the Southern Africa Power Pool.

Clarke wins first order in Cameroon

Clarke Energy has won its first order in Cameroon since becoming an authorised distributor of Jenbacher engines in the country.

The UK-based firm is to supply a 1.4 MW J420 Jenbacher gas engine to Flour Mill SCTB s.a. to provide more reliable, cost-effective, on-site power for the company's mills in the city of Douala.

Oil

Hint at production freeze excites oil market

- Iran describes oil freeze idea as "ridiculous"
- Saudi Arabia hopes prices have bottomed out

David Gregory

In mid-March Brent crude managed to crawl back up over the $40/b mark on the assumption that oil producers would freeze output at January levels. Whether that proves to be the case is a great unknown.

At the end of February, Brent crude settled at $35.97/b compared to $41.54/b three weeks later. During that time, West Texas Intermediate (WTI) went from $33.75/b to $39.91/b.

For now the market is counting on Opec and Non-Opec producers to reach an agreement when they meet in Doha, Qatar, on April 17 that will keep crude production among them frozen at their respective January output rates. This, in theory, will be one way of reducing the 2 million b/d overhang of supply and gradually increase crude oil prices.

That is a lot of overhang and it should be noted that in its latest monthly *Oil Market Report*, the International Energy Agency (IEA) predicted oil demand will grow by 1.2 million b/d (by 1.2 per cent) during 2016. The main factors for this, the IEA said, "are an uncertain macroeconomic backdrop, mild first quarter 2016 OECD winter temperatures, acclimatisation of consumers to lower prices and non-OECD subsidy cuts."

Global oil demand is forecast to average 95.8 million b/d during 2016, while current supply is 96.5 million b/d, according to the IEA. Of that, Opec output averaged 32.61 million b/d in February, the agency reported.

Some 15-16 oil producers are expected to take part in the meeting, but Iran will be conspicuous by its absence. Iran had initially commented that a production freeze could be a positive move, but later described the idea as ridiculous.

Iran has announced plans to boost its production to 4 million b/d and has said it would not consider a freeze until it reaches that target. During February Iran produced 3.22 million b/d. Since international sanctions were eased, Iran has worked to bring production back on-stream as quickly as possible. December 2015 output was 2.91 million b/d, according to the IEA. Exports for January have been estimated at 1.55 million b/d.

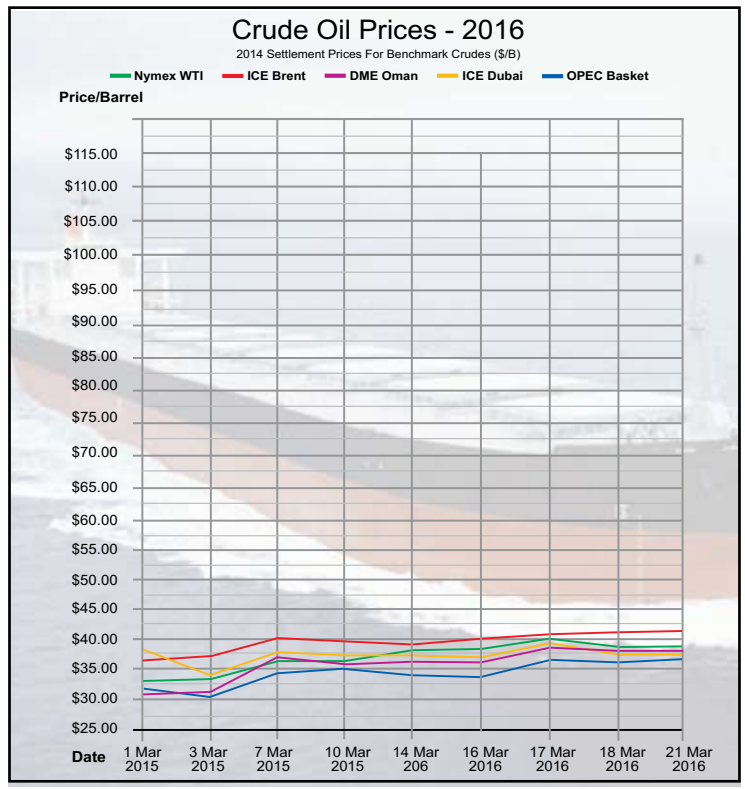
Iran's refusal to join the freeze might make it less effective, but Saudi Arabia is expected to go ahead whether Iran participates or not. Saudi Arabia's output in January was 10.21 million b/d. It has a sustainable production capacity of 12.26 million b/d.

Speaking in Vienna on March 21, Opec Secretary General Abdalla Salem el-Badri said some Opec members would likely attend the meeting, which was organised after Saudi Arabia, Russia, Qatar and Venezuela met in mid-February and agreed to hold oil production steady.

Talk of the production freeze had already had a positive impact on price, Badri said, but added that there was no way now to see what steps might be taken afterwards if this plan worked.

"Let us now go step-by-step. Let us now go to the freeze and see what will happen, and then we will talk about other steps in the future," he said.

"I hope it will be a successful meeting. I hope that the prices have bottomed (out) now. I don't expect prices will go high but I think they will go to a moderate level," Badri said.



While the purpose of the exercise is to get prices to increase, Russia's Energy Minister Alexander Novak said in mid-March that it might not be a good idea to push oil prices above $60/b as it would provide an incentive for inefficient projects to restart and thus create a new surplus for the market.

There is widespread speculation that as crude oil prices rise, US shale oil producers that have been forced out of the market by low prices would come back into production, leading to more supply and subsequently another decline in prices.

Novak said the market's reaction to the production freeze would have to be monitored very closely and that it is important to reach balance in the market as soon as possible. "This is what the freeze is all about, to cut supply to the market," he said.

But there's no guarantee that even those who sign up to the production freeze – if it is in fact agreed – will abide by the agreement themselves. It is likely that if prices do begin to rise, it could be very tempting for an oil producer to up production just a little bit in order to cash in on a rising prices when it appears possible.

Gas

Southern Gas Corridor begins to take shape

The actual start of construction of the Trans Adriatic Pipeline will move a project that has been in the works for more than a decade into the realm of practicality.

Mark Goetz

Construction work on the 878 km Trans Adriatic Pipeline (TAP) is scheduled to begin in several months' time following the award of construction contracts and approval by the European Commission of the Host Government Agreement between TAP and Greece.

TAP is the third component and European section of the Southern Gas Corridor (SGC), a gas conveyor project designed to transport Azerbaijan's Shah Deniz gas across the Caucasus and Turkey to markets in Central Europe.

When complete, it will deliver 10 billion cubic metres (bcm) annually of Azeri natural gas into Central Europe and drop off 6 bcm/year in Turkey along the way, thus providing Europe with improved energy security and diversity of supply.

Work has already begun on the other two sections of the SGC, which will stretch a total length of some 3500 km and require an ultimate overall investment of $45 billion.

The other components of the SGC is the existing Southern Caucasus Pipeline (SCP) and the new-build Trans Anatolian Natural Gas Pipeline (TANAP).

The SCP runs from Baku in Azerbaijan to the Georgia-Turkey border, covering a distance of 691 km. This pipeline came into operation in late 2006 and currently transports about 6.8 bcm/year of Shah Deniz gas, nearly all of which goes to Turkey.

Expansion work on the SCP Expansion (SCPX) project is underway and involves the construction of two extra pumping facilities in Georgia. It will have a capacity to transport a further 16 bcm/year from the offshore Shah Deniz field which is now in its second phase of development.

Work on TANAP, which is the centre section of the SGC and which will cost $10 billion to construct, is also underway. It will run 1850 km from eastern Turkey across the north of the country and connect with TAP at the Turkish-Greek border.

Deliveries of Shah Deniz 2 (SD2) gas will arrive in Turkey in 2018 and markets in Europe will begin to receive shipments in early 2020.

While the pipeline will at this stage provide only 10 bcm/year of Azeri gas to Europe, future gas production in the Caspian Sea region could be transported through this route. Azerbaijan has huge gas resources deep beneath its Azeri-Chirag-Guneshli oil fields and the EU has long sought to convince Turkmenistan to ship gas to Europe through the SGC.

Already under discussion are options for a hook-up between TAP and the Interconnector-Greece-Bulgaria (IGB) pipeline that would send Azeri gas into Bulgaria and possibly Romania through the proposed Vertical Corridor pipeline project.

Also proposed is another diversion from TAP in Albania for the Ionian Adriatic Pipeline (IAP), which would transport gas northward through Albania, Montenegro, Croatia, Bosnia-Herzegovina and potentially other Balkan states.

Furthermore, once TAP makes landfall in Italy, that gas transport network will enable gas shipments to northern and western Europe. The pipeline's initial capacity is 10 bcm/year but phase two expansion would boost capacity to 20 bcm/year.

TAP announced last month that it had awarded engineering, procurement and construction (EPC) contracts for five sections of pipeline that will run across northern Greece and Albania.

TAP said that mobilisation of the EPC contractors would begin immediately and continue through the second quarter of 2016 in line with the project's schedule to begin construction activities mid-2016.

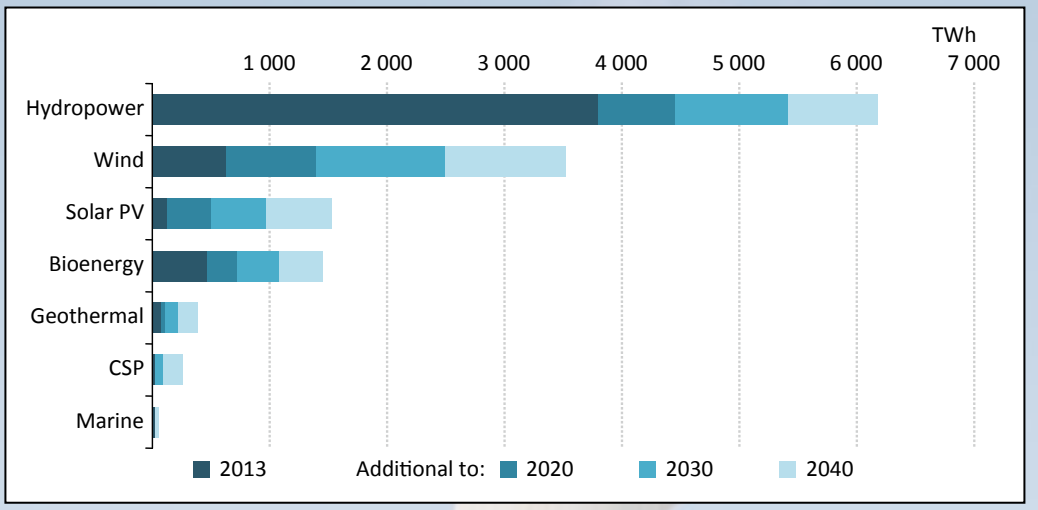
TAP's senior executive for its operations in Greece, Rikard Scoufias, said that lower oil prices will not prevent the project from going ahead, according to a *Reuters* report.

Low oil prices have introduced a debate in the markets regarding the impact they might have on the demand for gas, but Skoufias said the oil market situation would "not have an impact in terms of challenging the realisation of TAP in any way," adding that the final investment decision for TAP had already been taken.

TAP would, however, put emphasis on the project's cost management, he said.

The entire SGC project is a new test for Europe on the whole. It will introduce a new source of gas for the continent and open up the possibility for other future gas deliveries from points east of the Bosphorus, but aside from markets and funding having to be right, the geopolitics will need to be right too, and in today's world, that could take some time.

Global renewables-based electricity generation by technology in the New Policies Scenario



World Energy Outlook 2015, © IEA/OECD; Figure 9.2; page 350

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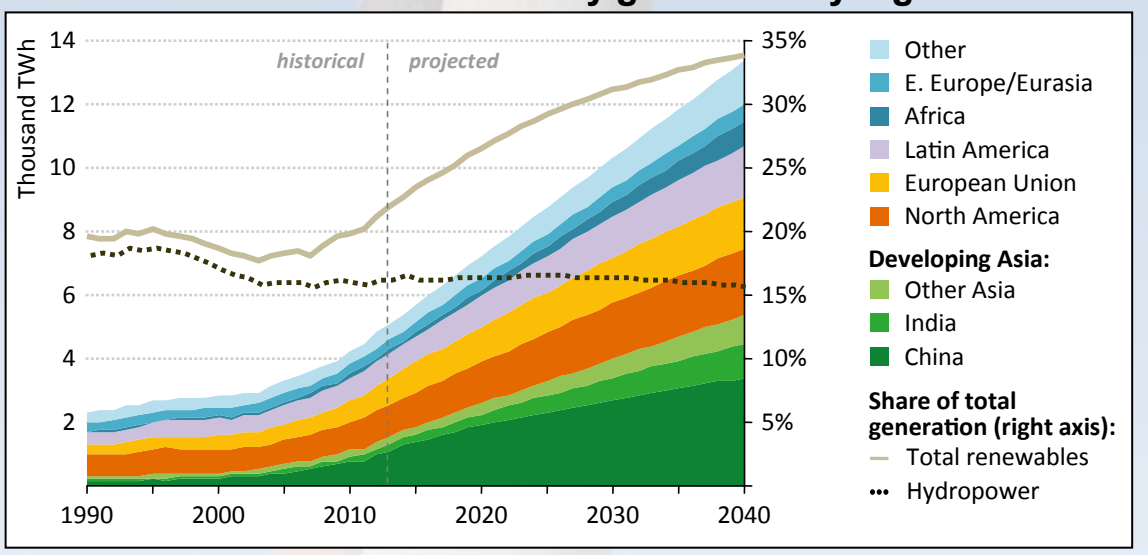
Global renewables-based electricity generation by region in the New Policies Scenario



World Energy Outlook 2015, © IEA/OECD; Figure 9.3, page 351

Cumulative renewables gross capacity additions by region and type in the New Policies Scenario (GW)

	2015-2025						2026-2040						2015-2040
	Hydro	Bioenergy	Wind	Solar PV	Other*	Total	Hydro	Bioenergy	Wind	Solar PV	Other*	Total	Total
OECD	**45**	**24**	**242**	**158**	**13**	**482**	**38**	**45**	**432**	**289**	**51**	**854**	**1 336**
Americas	18	11	104	54	6	194	15	19	170	97	19	319	513
United States	7	9	82	47	4	150	7	15	132	80	14	248	398
Europe	23	10	122	50	4	208	17	19	227	123	23	409	617
Asia Oceania	4	3	16	54	3	80	6	7	35	69	10	126	206
Japan	3	1	4	43	1	52	4	4	12	51	3	74	126
Non-OECD	**276**	**55**	**270**	**227**	**14**	**841**	**333**	**86**	**507**	**453**	**65**	**1 444**	**2 286**
E. Europe/Eurasia	11	3	5	2	1	22	23	10	18	8	2	61	83
Russia	5	1	1	0	1	9	14	7	5	1	2	28	37
Asia	179	43	234	195	6	658	191	56	400	343	25	1 015	1 672
China	108	30	170	123	2	433	90	26	261	169	14	560	993
India	27	6	54	58	1	145	38	11	94	131	5	279	424
Southeast Asia	17	4	4	8	3	37	37	9	17	26	4	93	130
Middle East	7	1	3	7	1	19	5	4	38	41	14	101	121
Africa	27	3	8	13	4	56	49	7	18	44	20	139	195
Latin America	51	5	19	9	1	86	64	10	33	18	4	129	215
Brazil	29	4	16	6	-	55	33	7	24	9	1	74	129
World	**321**	**78**	**512**	**385**	**27**	**1 323**	**371**	**131**	**939**	**742**	**117**	**2 299**	**3 622**
European Union	16	9	111	47	3	187	12	18	214	121	22	387	574

* Other includes geothermal, concentrating solar power and marine.

World Energy Outlook 2015, © IEA/OECD; Table 9.4 , page 370

Source: World Energy Outlook 2015

Preparing for the single bill

With the introduction of the single bill model, Europe's electricity companies face a credit risk that goes far beyond their own normal business risk. Eurelectric has published a benchmarking report aimed at compiling existing national solutions to the problem.

Hans ten Berge

Electricity is a peculiar commodity. Unlike most other goods, consumers buy it on credit – often on the basis of their estimated consumption – and only pay for it afterwards. This as such is not something new in the history of electricity. However, the introduction of the single bill model, soon to be in place in the vast majority of Member States, is creating an issue of credit risk for companies, with potential repercussions for customers.

In practice, where the single bill is in place, the supplier sends a bill on behalf of several players: on his own behalf for the electricity consumed, but also on behalf of network operators for the use of grids and of governments for taxes, levies and policy support costs (i.e. VAT, funding of certain generation technologies, energy efficiency schemes etc.). The clarity of this model is likely to facilitate customers' participation in the market (customers have just one counterpart to deal with) and Eurelectric thus fully supports it.

Yet, the single bill also has a potential downside that needs to be addressed. In most Member States, when customers do not pay their bills, suppliers must still pay the network operators and the government for their respective parts of the bill. As such, they face a credit risk that goes far beyond their own normal business risk.

Over the past few years, suppliers' exposure to missed or late payment has exploded and, as a result, the costs of managing arrears have also dramatically increased. These represent no less than €370 million/year in Italy and €75 million/year in Belgium. This is largely due to: i) the general increase of retail prices in Europe – which as such is a direct consequence of rising taxes, support costs and other levies and ii) the persistent economic downturn, which affects both individuals' incomes and companies' profitability.

A year ago, Eurelectric decided to start working on a benchmarking report aimed at compiling existing national solutions and at developing thoughts and proposals for a comprehensive handling of the issue. The objective of this exercise was to assist retail companies and electricity associations to engage with their regulators and governments, and to show them the breadth of remedies used across Europe, as some of them might be usefully introduced in their own countries.

According to the paper, suppliers certainly have a role in helping customers who struggle with their electricity bills. They should indeed provide energy advice, payment arrangements and/or appropriate debt management processes. Yet, clearly, the regulatory framework also needs to ensure that the single bill model remains sustainable. While some Member States have introduced measures for suppliers to manage arrears and the risks associated with supplying electricity on credit, there is a significant degree of variation in practices across the EU and in some countries remedies are clearly insufficient. Eurelectric therefore calls on national governments and regulatory authorities to take action.

This is crucial for all – electricity companies and consumers alike – as it would help guarantee:

- Affordability – unpaid bills can have a knock-on impact on final prices to the detriment of all customers, including those with low incomes and yet a good payment record. This as such can push more consumers to become "energy poor".
- Transparency – covering the cost of managing arrears by increasing the relative share of the energy component would limit the transparency of prices and bills, thus endangering customer trust.
- Choice – a high credit risk impacts the financial stability of suppliers and inflates the cost of supply activities, thus creating a market entry barrier and eventually reducing competition and market dynamism.

Member States should also ensure that specific measures exist for the protection of the most financially vulnerable. As customers with an energy debt are likely to have other debts (e.g. rent, water, tax, credit cards), assistance is generally best delivered by state-funded social policy and independent advice aimed at addressing customers' financial well-being as a whole.

Given the divergences in regulatory systems, market structures and consumer behaviour across Europe, Eurelectric's paper does not suggest which remedy to implement. Instead, it lists the solutions applied at national level and leaves it up to stakeholders at national level to decide what is best to do. Here are some of our key findings:

- In most countries with a single bill model, suppliers have to pay transmission and distribution charges to network operators irrespective of whether customers pay their energy bills or not. France is the only exception to this rule as suppliers pay grid fees ex-ante but can claim them back when bills are not paid.
- As for taxes and levies, suppliers have to pay them to national authorities, except – under well defined circumstances – for VAT in a few countries (Luxembourg, Belgium and France) and for all taxes in the Netherlands.
- The conditions under which a supplier is entitled to stop supplying a customer with large arrears differ significantly between Member States, especially in terms of process length, e.g. one month in Austria, 45 days in Poland, two months in Hungary. In some cases, disconnection is not possible at all, e.g. in Belgium (Brussels region) and France. Customers defined as vulnerable can generally not be disconnected.

Hans ten Berge: clearly the regulatory framework needs to ensure that the single bill model remains sustainable

- In most EU countries, some kinds of credit information registers exist. A few countries (e.g. Austria, Czech Republic, Denmark, Norway and Spain) have a centralised database.
- Suppliers are entitled to install prepayment meters (PPM) to customers with arrears only in a few countries such as Austria, Belgium (Wallonia), Hungary, Ireland, Poland and Great Britain. Some other countries (e.g. France, Spain) made some trials with PPM that were not really conclusive.
- In most countries, suppliers are entitled – under well defined circumstances – to ask for guarantee deposits from those customers with a bad credit history. In a few countries such as Belgium this is not allowed and in Poland suppliers can ask for deposits from commercial customers only.
- In most countries, suppliers are entitled to charge an interest rate on outstanding debt at credit recovery. This is not possible in Austria, Ireland, Spain (for customers still supplied from the regulated market) and Great Britain.
- In most countries, the arrears a customer accumulated with a supplier will remain with that given supplier if the customer switches to another one. A noteworthy exception is Italy where part of the arrears will move to the new supplier (so-called 'Indemnity System'). Also, in Great Britain ('Debt Assignment Protocol') and in Ireland (to be implemented), the arrears of a PPM customer are transferred to the new supplier in case of switch.
- In most countries, the new supplier is not entitled to charge a customer for the arrears accumulated with the old supplier. This is however possible in Italy and in Great Britain where the new supplier buys the debt from the old supplier for 90 per cent of the transferred debt's amount.
- In most countries, a customer who accumulated arrears with a given supplier can switch to another supplier, leaving the arrears behind. Only in Great Britain and in Bulgaria (until the customer signs a payment deferral protocol), a supplier can object to a customer switching away from them if they are currently in debt.
- In most countries, suppliers propose debt recovery programmes to customers who struggle with the payment of their bills – e.g. payment deferral. This is also a way to prevent disconnection.
- In most EU countries, specific treatments exist for vulnerable customers. Some Member States do not yet have a definition for vulnerable customers, which does not mean that specific measures do not exist for "protected" customers (e.g. Denmark, Finland, Germany, Sweden).

All existing measures and Eurelectric's high-level recommendations on how to mitigate credit risk can be found in the paper: "Mitigating credit risk in the interest of electricity consumers" at http://www.eurelectric.org

Hans ten Berge is Secretary-General Eurelectric, the association representing Europe's electric utilities.

The power of data and the Internet of Things

As the Internet of Things becomes more established, data can drive innovation and competitive advantage as decision makers are presented with an even bigger picture.
Steve Ehrlich

Amidst the plethora of challenges utilities face, the ultimate priority is to keep the lights on. To achieve this, they must deal with issues such as ageing infrastructure, complex production and supply networks and unforeseeable circumstances.

The ability to analyse data and gain insights that can be used to improve strategic and operations management is therefore crucial to managing a profitable utility. The hunger for these insights based on monitoring assets in the field and analysing the data they produce makes the Internet of Things (IoT) a powerful resource for utilities.

Given all the moving parts of a utility, planning and managing its supply is a process of engineering. Utilities have hundreds of discrete systems that automate some portion of their processes for operating the grid, serving customers and regulatory compliance. These systems deal with areas such as customer information, meter data management, outage management and work order management.

In addition, for decades utilities have used sensors on critical power equipment in the grid and power plants to generate operational data. These systems are islands of sensors and electromechanical actuators for a narrowly defined mission and typically not connected to the Internet for security reasons.

Ehrlich: Ultimately, situational intelligence helps utilities keep the lights on

Still, their use of sensors across the grid qualifies utilities as pioneers in the connected economy of the IoT. While the IoT is a challenging beast, it may hold the key to cost-effectively procuring the supplies that keep utilities operating smoothly.

Gartner predicts that the global IoT will collectively connect over 25 billion devices by 2020. No small part of this will be devices that exist within a utilities network. Whether it's a wind turbine motor, a smart meter, or a light switch, it will be connected to a smart ecosystem of connected devices, all of which will be collecting data in real-time.

> While the IoT is a challenging beast, it may hold the key to cost-effectively procuring the supplies that keep utilities operating smoothly

IoT data supports predictions of asset failure, renewable generation, severe weather formation and urban network loading. While this wealth of data is relatively new, and supply management undoubtedly faces a challenge in turning it into a strategic asset as opposed to an operational challenge, it is good news for utilities. As the IoT becomes more established, data can drive innovation and competitive advantage as decision makers are presented with an even bigger picture, thanks to data sets collected over the course of years that reveal insightful patterns and trends.

As the IoT continues to grow, utilities need to follow the lead of companies such as Twitter, Facebook and Amazon and discover how customer insight and service that is based on data collected analysis can drive innovation. This forces utilities to think beyond their discrete functional systems to improve their overall level of performance and service.

To unify their discrete systems, utilities need new tools and capabilities to manage, analyse and visualise the nearly instantaneous production and transfer of data. The consequences of managing and using real-time data from the utility's sensors, discrete systems and third-party sources challenge the stability and security of utility businesses and their ability to reliably serve changing customer needs.

The bad news is that IoT data arrives at great volume and with great speed. This means it is liable to pile up, placing strains on IT infrastructure and storage capacity levels. It sits in silos, which means data collected about '*x*' is too far removed from data collected about '*y*'. Without analysis, IoT data is of limited value to supply managers looking to solve problems and drive innovation with the utilities network.

To turn data from an operational headache into a strategic asset, it needs to be analysed across silos. It must do this in a way that does not focus on what has happened, but asks a more pertinent set of questions. What is happening? What will happen? Where is it happening? Why is it happening? Is what's happening related to where or when it is happening?

Taking a more predictive approach to analytics better enables a business to do something about an individual incident or act upon a trend that has developed over time. To do this, the data sets that are churned out of the sporadic and widespread ecosystems that are typical to utilities need to be mapped, organised and analysed in their wider context.

Utilities need an analytics approach that correlates and analyses data from as many data sets as you need it to, and provides the what, where, when, why and how of every asset and situation – otherwise known as situational intelligence. It allows utilities to weigh-up thousands of different scenarios and choose the best possible combination of answers, before deciding on and prioritising the actions which must be taken in order to reach the best possible outcome. At a macro and micro level, situational intelligence harnesses the extraordinary power of IoT data for the benefit of utilities businesses.

Hydro One is the largest electricity transmission and distribution utility serving Ontario, Canada – providing power to an estimated 1.3 million customers through 287 transmission sites. It has been able to significantly reduce the risk of asset failure and lower the cost of managing its asset fleet, through the visualisation and analysis of 4.5 million transmission and distribution assets using situational intelligence.

For another example of situational intelligence at work we can turn to the Sacramento Municipal Utility District (SMUD) – a publicly owned electric utility in California, which covers a service area of approximately 2331 km^2 (900 square miles). Its challenge was to turn data into information that would allow operators to make better, faster and more reliable decisions.

Situational intelligence gave SMUD the ability to integrate masses of data from its operational and informational technology assets, as well as external sources, for example, weather data. With all of these data sets to work with, the system allows SMUD to view any system issues geo-spatially and in detailed tabular form in a single dashboard. As well as allowing its engineers to make more timely decisions about issues within the grid, it is also enabling SMUD to look towards the future.

At a strategic level, the utility is looking at optimising its grid to deal with innovations on the horizon such as renewable generation, electric vehicles and mass smart meter rollouts and it is using situational intelligence to better understand how new technologies integrate within the existing grid. This will provide operators with information that will assist them in making the right technology investments to seamlessly integrate new asset networks.

As well as playing an active role in dictating strategy, SMUD's Situational Awareness and Visual Intelligence (SAVI) system has helped the company reduce operational costs and improve long-term profitability – a key aspect linked to strategic initiatives for utilities. SMUD has been named a member of the 2015 Grid Edge 20, an annual benchmark of the electric power industry in the USA, for its disruptive SAVI system using real-time visual analytics software.

Situational intelligence provides a framework for supply management to identify areas that require maintenance and potential areas of risk, as well as inform decisions on strategic investment and long-term operational focuses. The multiple data sets derived from disparate asset networks are visualised in a form that provides a macro view of how the utility is performing generally as well as the priorities of the hour.

By unifying their discrete systems to better understand the big picture and execute the necessary immediate actions, utilities can achieve their strategic and operational objectives. Ultimately, situational intelligence helps utilities keep the lights on.

Steve Ehrlich is Vice President Marketing and Product Management, Space-Time Insight

Developing distribution grids

A demonstrator delivered during the Grid4EU project has paved the way for the introduction of advanced metering and visualisation on low voltage distribution grids across Europe. **Erik Hamrin** explains.

The four-year Grid4EU project recently reported its findings in Paris. The project was designed in response to a call from the European Commission (EC) for ideas to lay the groundwork for tomorrow's electrical grids. Ambitious renewable energy targets and large-scale introduction of electric vehicles mean that operators will need to make major changes to transmission and distribution grids to keep the lights on.

To address the challenges represented by the changes, ABB was one of 27 partners, alongside utilities, energy suppliers, vendors and research institutes to test the potential for smart grids in areas such as renewable energy integration, electric vehicle development, grid automation, energy storage, energy efficiency and load reduction.

The EC set five main objectives: to develop and test innovative technologies, define standards, guarantee scalability, guarantee replicability across Europe and evaluate the business case and cost-benefits. To achieve these, six demonstrators ran from November 2011 to January 2016 to account for Europe's varying climates, population densities and network topologies, and enable comparison between the different smart grid technologies.

One aspect that was central to Grid-4EU was that by working in partnership, grid operators, academics and technology vendors would each bring the benefits of their experience. This led to a more integrated and rigorous approach than would have been possible by working in isolation – ultimately leading to a better understanding to develop solutions that will improve the reliability of power supply for end customers.

ABB participated in three of the six demonstrators because Grid4EU offered the opportunity to work in partnership with leading grid operators, academics and other smart grid vendors. Of these, Demonstrator 2 (Demo 2) has shown the potential for the introduction of advanced metering technology across Europe.

Performed in Uppsala, Sweden, Demo 2 focused on the development of monitoring functions on the LV distribution network. Metering has great potential for improving grid reliability. In principle, the data from entire fleets of meters can give operators greater visibility of the conditions on the grid, which in turn improves reliability by monitoring for outages, events and power quality issues.

Vattenfall is the DSO (distribution system operator) for the Uppsala area and already has a high degree of advanced meter management (AMM) technology on its networks, with meters distributed across the network at customer premises.

The main idea of the demonstrator was to investigate what functionality could be designed if a system had access to both consumption data and meter events from the customers as well as consumption data and alarms from the secondary substations that supply energy to them.

To realise this functionality, three tasks needed to be accomplished. Firstly the secondary substations needed to be equipped with communication equipment in the form of remote terminal units (RTUs) to gather information. Second was the establishment of interfaces to pass information between the existing AMM and RTU. Lastly a software stack was built to visualise the data.

When all these elements were ready, the project started by looking at how to improve decision-making for network operators and network planning staff by selecting and reporting the best data.

The first of the three tasks was the development of the RTU-cabinets for the secondary substations. A wide variety of secondary substations exist in LV grids, ranging from small pole-mounted stations to big indoor stations in urban areas.

With Grid4EU's objective for scalability in mind, it was obvious that the design of the cabinets needed to be generic to allow all types of substations to be covered by a small set of cabinets.

For the project, ABB developed four modular cabinets to meet the differing requirements of substations in the field. Inside each cabinet an RTU handles communication and multi-meters convert measurements to signals, while a GPRS modem sends data to the LV SCADA in the dispatch centre (DC) where it is processed. The four models range in size to handle between one and 17 sets of signals.

The design of the modules is compact but functional. With Uppsala being in northern Sweden, heaters were included as well as the main functional components. All cables and antennas are contained inside the cabinets, which can be mounted on an outdoor wall. For the very smallest substations, where space is extremely limited, individual DIN-rail modules can be removed from the cabinets and fitted wherever there is room.

A total of 108 cabinets were installed in the field and connected with customers' existing meters. They gave Vattenfall's dispatch centre access to data from both customers' meters and the substations. This opened up the potential to introduce new functionality.

In parallel with the RTU deployment, ABB developed a software stack that combined three components that enabled operators to visualise grid operations.

The first software was ABB's MicroSCADA for supervisory control and data acquisition, which routes data. Second, DMS600 is a distribution management system that maps out the entire low voltage network. Third, the SYS600 Historian database enables logging and reporting of historic data.

Vattenfall's operators and ABB's engineers agreed to prioritise four aspects of grid operation. These were outage detection, visualisation of meter events, monitoring of losses, and visualisation of historic power quality.

For outage detection, alarms were established to monitor the voltage of outgoing feeders in each substation. Voltages were measured on the busbars and sent via the RTUs to the dispatch centre, where the LV SCADA system continuously monitors the feeder's consumption pattern and triggers an alarm when it drops below a set threshold.

Hamrin: In principle, the data from entire fleets of meters can give operators greater visibility of the conditions on the grid, which in turn improves reliability

Operators could immediately see which line reported the outage through the map representation of the entire LV network in the distribution management software.

Meter events are treated much the same, as the distribution management system will show operators the type and location of the most important events. Identifying and recording events such as meter failures, tampering or overcurrent identifies trends and problem areas.

Monitoring power losses and visualising historic power quality rely on the SYS600 Historian database.

DSOs monitor power loss to compare supplied energy with billed energy for feeders, groups of feeders and whole substations. The technique identifies faulty meters or even power theft by integrating data from customer meters and substation monitoring, and presenting the differences visually on a graph.

The final set of data that was recorded under the Grid4EU's Demo 2 was measuring and logging of power quality readings. Similarly to power loss, power quality readings were logged using a database.

In the case of Demo 2, Vattenfall established monitoring of the total harmonic distortion on its network. But DSOs can opt to focus on whatever aspect of power quality would be most helpful to them, such as voltage quality.

Demo 2 has been an eye-opener for ABB's Grid Automation team. By working towards the overlying goals of Grid4EU in collaboration with Vattenfall the team has gained deeper knowledge of the needs of DSOs. This is hugely helpful when developing smart grid products.

One insight from working on the LV network has been that such grids are usually not as well documented as the medium and high voltage networks. Plus, their scale is large – in common with many semi-rural and rural parts of Europe, Vattenfall's LV network in Sweden contains tens of thousands of secondary substations. For a bigger rollout to be possible it is vital that any solutions are generic and modular and that they can be built and deployed easily.

Secondly the multitude of data made available during such a deployment means that we must put firm limits on what data to monitor and send. Traffic volume drives cost and as a vendor ABB has the chance to help DSOs minimise these costs. Demo 2 has been instrumental in defining exactly what data should be sent and when.

Now that Grid4EU is finalised, the project has clarified the next steps for grid automation in Europe. The next step in European smart grid is underway under the banner of Horizon 2020. ABB is also making progress on several commercial projects, with more due to start soon. With the market for grid improvements picking up, ABB is looking forward to help drive this change.

Erik Hamrin is project manager at ABB Grid Automation systems in Sweden.

Junior Isles

Living in a digital world

The 'Internet of Things' (IoT), 'Industrial Internet', 'big data', 'data analytics', 'the digital enterprise' – all terms that were virtually unheard of in the power industry a few years ago but are now part of the sector's vocabulary. New terms for new times.

Certainly there was evidence of the changing times at a recent press conference held by Siemens ahead of the upcoming Hannover Messe 2016. Once upon a time the headline theme "Driving the Digital Enterprise", or the achievement of end-to-end digitalisation, would probably have only attracted journalists from the worlds of software, IT and other industrial engineering sectors. This time, journalists from the power and energy sector were also in the room.

It is all a result of the shifting energy landscape. Whether you are a journalist, one of the big equipment suppliers or solutions providers, an energy supplier, network operator or industrial company, the new digital world is bringing change for all of us.

Decentralisation is a one of the big drivers of digitalisation. Knowledge through data collection and management is seen by many as the key to future success and for some, even survival in a world where there is a clear shift towards distributed energy generation.

Speaking on the sidelines of the conference, Ralf Christian, CEO of Siemens' Energy Management Division, said: "Although not yet everywhere globally, we are seeing a big shift towards a different energy future. There's a move from the classic 1960s and 70s mind-set of how you generate, transmit and distribute energy, to where we are today and where we will most likely be a few years from now.

"We strongly believe there is an ongoing shift from centralised large-scale generation towards a more balanced approach where there will still be some large-scale generation but a lot of decentralised generation."

In Europe in particular, the shift presents a big challenge to the normal business models for utilities. Decentralisation – bringing volatility on the generation side, unpredictability on the demand side and new players into the market – combined with new customer demands, has seen utilities struggle to manage their businesses.

To address growing demands for more climate protection and handle the increasing integration of renewable energy sources, energy systems have to be made more flexible and smarter. This applies in particular to energy-intensive industrial enterprises.

Christian said: "Power supply is a part of the digital enterprise. By using smart energy management, industrial enterprises can operate their plants and processes economically, efficiently and safely. Advancing digitalisation is a decisive lever for this."

Siemens noted that microgrids are central to this. By combining a range of generation sources with energy storage and intelligent load management, microgrids provide reliable, economic and environmentally friendly power supply. They can also be used as black start power or to bolster the grid during periods of heavy demand.

Microgrids are predicted to be an increasingly important area. An October 2015 report from consultancy Ernst & Young estimated that in the 20 countries analysed by the company, microgrids could provide anywhere between $64 billion and $171 billion in electricity cost savings for commercial companies by 2020.

Microgrids were also the topic of a recent roundtable held by ABB in London.

During the discussion ABB said micro-/nano-grids is one of three key areas in the transformation of the electrical value chain – the other two being more renewables in the generation mix, and increasingly intelligent transmission and distribution systems with greater amounts of data that can be used for better network management.

Maxine Ghavi, ABB Group SVP, Program Director, Microgrids noted: "What we're also seeing is a trend toward more complexity and a reduction in cost. If you look at distributed energy resources (DERs), in the past they have been small installations – not much data but simple to manage and operate. Then we started moving towards larger, more complex systems with commercial buildings, institutions, etc. but they needed more optimisation, and so we moved up the curve. Now we are seeing larger installations – a lot more distributed energy, with more different types of distributed generation coming on line, e.g. combined heat and power, renewables etc. Micro- and nano-grids are a key component in this shift for us."

Notably, microgrids are not just about secure supply and integrating renewables. They also offer industrial companies new scope and new business models such as participation in the energy market or smart load peak management to ensure economical power supply.

"Another key component that we are seeing coming on more and more, is services. If you have a distributed energy resource, you can play in the ancillary services [market]," said Ghavi.

This type of opportunity, which requires more intelligence in distribution grids on the industrial side, is driving more investment in low voltage networks.

It is an exciting development for industrial consumers and vendors alike.

Christian commented: "This is pretty much new territory. When you think about the industrial side, it used to be just about the physical robustness of distribution, not about smartness. In the past, power came in and had to be reliably distributed. Now there is a lot of discussion with industrials looking at how they can benefit from low rates at certain times, etc. So there is not only a big shift on the traditional utility side, there's a big shift in how you deal with energy on the industrial side."

Siemens has been preparing for what it calls a digital transformation. Last year its Energy Management business unit invested around €350 million in R&D, a figure that is growing.

Christian said: "This is more than we have invested in the past and we have significantly increased investments within that overall budget into software solutions and automation – things that you need to manage more decentralised energy."

According to Christian, microgrids represents about 20 per cent of Siemens' smart grid portfolio but it is an area that will continue to grow.

"Today, in the bigger scheme of things, it's not a dominating amount yet. But going forward it will grow because we see higher growth rates in those [smart] portfolio elements than in classic hardware. The smart portfolio represents around 20 per cent of the overall division today and will grow to around 30 per cent by 2025," he said.

According to Siemens, another key issue is the need to ensure security of supply, using modern protection concepts to safeguard plants and systems against overloading or short-circuits. The increasingly distributed generation of energy within a plant itself is also changing the way in which industrial enterprises and energy providers interact.

This changing landscape calls for new planning and energy management concepts for networks and systems, which are able to guarantee a robust, cost-optimised supply of power. Siemens has therefore concentrated its power distribution portfolio in Totally Integrated Power (TIP), offering integral solutions for the economical planning, control, protection and optimisation of energy systems specifically to industrial enterprises.

The amount of movement in the market and experimentation in business models makes for an interesting industry. Utilities will have to learn how interact in different ways with both their customers and traditional equipment vendors. At the same time industrial companies are joining the game.

With the lines blurring, the future will be increasingly about forming partnerships. The traditional vendor-customer relationship between equipment suppliers and utilities will become more of a partnership. At the same time those same utilities will be working more closely with end consumers to deliver new services and manage demand. Network operators, meanwhile, will have their hands full trying to balance supply and demand. As for us traditional power journalists, we have a plethora of new terms and words to get accustomed to.

Cartoon jemsoar.com