

# THE ENERGY INDUSTRY TIMES

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# Paris Agreement comes into force

The international community is ramping up efforts to combat climate change as the Paris Agreement comes into force. **Junior Isles**

In early October the number of countries ratifying the Paris Agreement passed the 55 per cent threshold of total global greenhouse gas (GHG) emissions, allowing the Paris Agreement to come into force on November 4th, in time for COP22 in Marrakech, Morocco.

The way was cleared for the agreement to come into force when the European Parliament (EP) approved the ratification on October 4th.

The EU's decision came just after India, another of the world's major polluters, also formally ratified the agreement. The US and China, the world's two largest GHG emitters, had formally joined the Paris agreement at the start of October. More recently Indonesia, the world's fourth

most populated country, also endorsed the agreement, paving the way for it to become part of the country's laws.

As of October 24th, 84 of the 197 Parties to the Convention had ratified the agreement.

The Paris agreement calls on countries to combat climate change and to accelerate and intensify the actions and investments needed for a sustainable low carbon future. Specifically, it seeks to limit global temperature rise to well below 2°C, and to strive for 1.5°C.

Following the ratification, Nick Molho, Executive Director of the AIDERSGATE Group commented: "Global leaders must now use the COP22 summit in Morocco to start thrashing out the details of some of the major

commitments made in Paris last year.

"The unprecedented speed by which the Paris Agreement will have entered into force is a significant achievement for international climate diplomacy. It confirms global political support for the transition to a low carbon economy, something which the world economy has already embarked on with a record \$285 billion invested in renewable energy last year."

The global action to combat climate change certainly calls for substantial investment, over and above that pouring into renewable energy.

In mid-October, developed countries reiterated their promise to finance climate change in developing countries worth up to \$100 billion per year. The pledge, to help with the

funding of climate adaptation for developing countries, was part of the Paris Agreement and \$62 billion was given in 2014, up from \$52 billion.

Developed nations said in a report compiled by Australia and Britain: "We are confident we will meet the \$100 billion goal from a variety of sources, and reaffirm our commitment to doing so."

New funds were committed by more than 30 countries last year, including the US, France, Germany, Canada, Japan and Australia.

Already \$67 billion should be provided in 2020 by the public sector alone, according to the Organisation for Economic Cooperation and

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## Global energy demand growth set to fall, says WEC

The World Energy Council (WEC) has identified that per capita energy demand will peak before 2030. This is in stark contrast to historic growth levels, which have seen global demand for energy more than double since 1970. Technological innovation, government policies and lower growth expectations will have a significant impact on the sector in the coming decades.

The findings come in a new set of exploratory scenarios, developed in collaboration with Accenture Strategy and the Paul Scherrer Institute, which were launched at the 23rd World Energy Council in Istanbul by the WEC. The three scenarios entitled "Unfinished Symphony", "Modern Jazz" and "Hard Rock" present three distinct trajectories for

the energy sector to 2060, with very different realities across regions.

The World Energy Scenarios, entitled 'The Grand Transition' were built by a network of more than 70 experts from over 25 countries and were quantified using a global multi-region energy system model by the Paul Scherrer Institute.

Speaking at the report launch Ged Davis, Executive Chair of Scenarios, World Energy Council, said: "It is clear that we are undergoing a grand transition, which will create a fundamentally new world for the energy industry."

"Historically people have talked about 'Peak Oil' but now disruptive trends are leading energy experts to consider the implications of Peak Demand. Our research highlights

seven key implications for the energy sector which will need to be carefully considered by leaders in boardrooms and staterooms."

The report goes on to highlight that there will be a shift in final energy consumption with demand for electricity doubling by 2060. Solar and wind, which currently account for approximately four per cent of power generation, will see the largest increase so that by 2060 they will represent between 20 per cent and 39 per cent of power generation.

Fossil fuel usage could fall to as little as 50 per cent of the primary energy mix in one of the scenarios, with very differing futures for coal, oil and natural gas. However, in all three scenarios the carbon budget is also likely to be broken within the

next 30 to 40 years. Oil will continue to play a significant role in the transportation sector representing over 60 per cent of the mix in all three scenarios to 2060 and natural gas will continue to increase at a steady rate.

A report by Arup says that growing cities, already accounting for over 50 per cent of global energy consumption, can no longer afford to rely on a centralised energy supply and will need to take greater control to meet growing demand. The Arup 'Innovating Urban Energy' perspective paper provided insight for the World Energy Council 'Scenarios Report' and shows that new technologies, innovative financing mechanisms and political changes are opening up opportunities for cities to secure their own energy.



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Development (OECD) in the report released last month. The report also says that increasing finance from the public sector could encourage the private sector to commit to the necessary remaining \$33 billion by 2020, achieving the \$100 billion.

Despite the progress that is being made and the speed at which countries have ratified the Paris deal, more still needs to be done. While the power sector is making good progress, other industries are struggling. A CDP report released at the end of September revealed that the steel sector is woefully under-prepared for this new regulatory environment. It noted that the industry needs a technological transformation that will reduce its emissions per tonne of steel produced by over 70 per cent by 2050 in order to meet Paris Agreement objectives.

Energy industry observers also reminded that the Paris Agreement as it stands will not achieve global emission targets.

Richard Black, director of the Energy and Climate Intelligence Unit (ECIU) said: "Currently the pledges governments made at Paris aren't strong enough to keep global warming well below 2°C Celsius, the target that governments adopted. But the Paris deal contains measures to 'ratchet up' national commitments, and its astoundingly quick entry into force raises the prospects of tighter emission cuts down the line that could yet steer the world away from dangerous climate change, as the majority of citizens globally want."



**Cañete: "Our collective task is to turn our commitments into action"**

EU Commissioner for Climate Action and Energy, Miguel Arias Cañete, said: "Our collective task is to turn our commitments into action on the ground. And here Europe is ahead of the curve. We have the policies and tools to meet our targets, steer the global clean energy transition and modernise our economy."

One tool that Europe has been hoping will cut emissions is its failing Emissions Trading Scheme (ETS). In October, the industry committee of the European Parliament voted 45 to 13 in favour of a compromise for reforming the EU's ETS.

In an effort to boost the price of CO<sub>2</sub>, which has been too low to encourage investment in low carbon energy, the committee is backing the removal of carbon permits from the market at a rate of 2.2 per cent per year between 2020 and 2030.

The proposal involves the creation of two different groups of energy-intensive industries – with "at risk" sectors given allowances covering 100 per cent up to a benchmark value based on the cleanest plants, and the rest given 30 per cent.

The Parliament's Environment Committee will vote on the reform in December and a plenary vote will be held in the beginning of 2017.

# Rosier renewables forecast

- Renewables represent over half of new capacity additions
- Wind capacity could hit 2110 GW by 2030, says GWEC report

Junior Isles

The International Energy Agency has upwardly revised its five-year growth forecast for renewables, thanks to strong policy support in key countries and sharp cost reductions.

The latest edition of the International Energy Agency's (IEA) 'Medium-Term Renewable Market Report' now sees renewables growing 13 per cent more between 2015 and 2021 compared with last year's forecast, due mostly to stronger policy backing in the United States, China, India and Mexico. Global renewable electricity capacity is expected to grow by 42 per cent (or 825 GW) by 2021. Over the forecast period, costs are expected to drop by a quarter in solar PV and 15 per cent for onshore wind.

Last year marked a turning point for renewables. Led by wind and solar, renewables represented more than half the new power capacity around the world, reaching a record 153 GW, 15 per cent more than the previous year.

Most of these gains were driven by

record wind and solar additions.

Launching the report, Paolo Frankl, Head of the IEA's Renewable Division said: "In terms of total capacity, renewables surpassed coal and became the largest source of power [generating] capacity in the world... but not generation."

According to the IEA, wind additions totalled 66 GW in 2015. The Global Wind Energy Council's (GWEC) 'Global Wind Energy Outlook', released in October, also showed that strong growth in wind is set to continue, outlining scenarios where wind could supply 20 per cent of global electricity by 2030.

The GWEC report forecasts wind power could reach 2110 GW by 2030 and supply up to 20 per cent of global electricity, reducing CO<sub>2</sub> emissions by more than 3.3 billion tonnes per year, and attract annual investment of about €200 billion.

Meanwhile, the IEA report also said solar PV additions reached 49 GW in 2015. About half a million solar panels were installed every day around the world last year, it said.

Over the next five years, renewables will remain the fastest growing source of electricity generation, with their share growing to 28 per cent in 2021 from 23 per cent in 2015. Renewables are expected to cover more than 60 per cent of the increase in world electricity generation over the medium term, rapidly closing the gap with coal.

World Energy Resources recently said the increase in renewables has led to an unprecedented change in energy supply.

Speaking at the launch of its new report at the World Energy Congress, Hans-Wilhelm Schiffer, Executive Chair, World Energy Resources, said: "The total global renewable energy based power capacity has doubled within the last ten years, from 1037 GW in 2006 to 1985 GW by the end of the year 2015.

"Our report finds that the diversification of technologies and resources, now applied in the energy sector, creates many opportunities, but the enlarged complexity also leads to increased challenges," said Schiffer.

While 2015 was an exceptional year, there are still grounds for caution. The IEA warned that policy uncertainty persists in too many countries, slowing down the pace of investments.

Last month eleven companies doing business in the renewable energy sector called for investment protection for renewable energy projects in Europe. The companies, including Acciona, Commerzbank and Enel Green Power, said that while the industry acknowledges the need to adjust regulatory frameworks over time to respond to declining technology costs and market developments, retroactive changes erode investor confidence.

The IEA report identifies a number of policy and market frameworks that would boost renewable capacity growth by almost 30 per cent in the next five years, leading to an annual market of around 200 GW by 2020. This accelerated growth would put the world on a firmer path to meeting long-term climate goals.

Frankl warned, however, that only wind and solar growth were on target in meeting climate change targets.

## Energy efficiency gains ground despite lower energy prices

As governments focus on implementing their commitments to save energy and reduce carbon emissions under the recently ratified Paris agreement, a new report from the International Energy Agency (IEA) highlights the progress made by energy efficiency policies around the world over the past year, particularly in China and other emerging economies.

The role of energy efficiency in the global energy transition is examined in the IEA's 'Energy Efficiency Market Report 2016', which finds that its importance cannot be overstated. It says "there are no realistic or affordable energy and climate change policy without a sizeable and vigorous" energy efficiency component.

Efficiency standards now cover 30 per cent of energy use globally, up from 11 per cent in 2000. IEA countries saved \$540 billion in energy expenditure in 2015 as a result of energy efficiency improvements since 2000.

The Paris-based organisation said

energy intensity – the amount of energy used per unit of GDP – improved by 1.8 per cent last year, meaning the global economy needed less energy to grow. The improvement exceeded the 1.5 per cent gain of 2014, and was three times the average rate seen over the past decade. This indicates the ongoing decoupling of economic growth and electricity generation.

The IEA added that last year's gains were achieved in spite of lower energy prices, which generally dampen the enthusiasm for energy savings.

Commenting on the report's findings, Dr Fatih Birol, the IEA Executive Director, said: "Energy efficiency is the one energy resource that all countries possess in abundance. I welcome the improvement in global energy efficiency, particularly at a time of lower energy prices. This is a sign that many governments push the energy efficiency policies, and it works."

However, the report also shows that while much has been accomplished,

global progress is still too slow. Global energy intensity improvements need to reach at least 2.6 per cent per year to put the world on a sustained pathway for a decarbonised energy system.

Intensity gains in 2015 were higher in non-OECD countries, which is a trend that is expected to continue. "The large emerging economies are moving to centre stage in the clean energy transition and the fight against air pollution, driven by energy efficiency and renewables," said Dr Birol.

One country in particular that showed significant progress is China, where energy intensity improved by 5.6 per cent. This was up from an annual rate of 3.1 per cent over the previous decade, according to the report. China's progress in energy efficiency is making its mark on global energy markets.

Primary energy demand in China grew by just 0.9 per cent in 2015, its lowest rate since 1997, while the economy grew by 6.9 per cent. Without this contribution, the global

energy intensity improvements would have been just 1.4 per cent in 2015.

The IEA has identified energy efficiency as a critical "fuel" in the transition to a low-carbon economy. Its analysis has shown that over a third of all emissions reductions needed to reach climate goals by 2040 must come from energy efficiency policies. By way of illustration, efficiency gains in the IEA's member countries were large enough to power Japan in 2015 making efficiency a critical component of a secure, sustainable energy system. The report demonstrates the central role of government policy in driving energy efficiency. It shows that policies must be strengthened and expanded to boost the potential gains from energy efficiency.

As part of its greater focus on energy efficiency, the IEA has also introduced the Efficiency Policy Progress Index (EPPI), which tracks mandatory policies and establishes a baseline to monitor future progress.

## Coal use has doubled since Kyoto Protocol

Global demand for coal has almost doubled since the Kyoto Protocol in 1997, despite growing climate change concerns, says a new report from Pöry.

The global coal fleet makes up around one third of total global electricity generation capacity and around 40 per cent of total electricity generation, it states. Pöry analysis has developed a retire-

ment profile for existing global coal capacity. The analysis reveals that without radical change, it is likely that the majority of coal-fired generation capacity will be with us for the foreseeable future, with the projection indicating around 1300 GW still in operation by 2040. Significantly, the projection does not factor the several hundred GW of new coal plant under construction

around the world and the many more that are still in planning.

The 'Coal Conundrum Point of View' report argues that despite "coal's cheap and abundant nature", which makes it an attractive source of electricity generation, its future role in the energy mix must include co-firing with biomass and a renewed focus on carbon capture and storage (CCS).

Matt Brown, Vice President at Pöry Management Consulting, said: "Our research has revealed a worrying situation where we risk sleep walking into the mid-century having not addressed the challenges posed by coal to the environment. Increasing the coal fleet's efficiency is very important but in addition we need to co-fire coal with biomass and push harder on CCS."



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# Kemper finally set for commercial operation

Southern Company's Kemper clean coal plant is gearing up for full commercial operations on syngas fuel.

The US energy company says that the integrated gasification combined cycle (IGCC) plant with carbon capture and storage (CCS), achieved first electricity generated by syngas produced from coal in September and that it expects the project to be fully operational by the end of November.

The Kemper facility has been criticised because of its cost overruns and delays. The project was originally due to start up in 2014 and cost \$2.9 billion to build, but actual construction costs have been \$6.9 billion.

There are also concerns about significant rises in predicted operation and maintenance costs. Southern has hailed the plant as a major step forward in the development of clean coal technology.

"After decades of research and years of hard work at the site, we are thrilled

that the Kemper County energy facility, the world's most advanced coal plant, has generated electricity using syngas," said Southern Company Chairman, President and CEO Thomas A. Fanning. "The technology at the heart of the first-of-its-kind facility provides a way forward for energy companies in the US and around the world to cleanly generate electricity using an affordable and abundant resource."

Southern said that the plant's gas cleanup system and associated gasifier had been operating since mid-September. It added that electricity generation would continue to involve testing on syngas, natural gas or a combination of both as progress continues toward commercial operation.

The next stage for the plant is the operation of Kemper's second gasifier, operating both combustion turbines using all syngas, followed by complete integration of the project's systems

leading to full commercial operation.

Southern has admitted in regulatory filings that the operation and maintenance costs of Kemper could be much higher than originally envisaged.

The company estimated the operations and maintenance costs for Kemper at about \$258 million over five years when it originally sought authorisation in 2010 from the Mississippi Public Service Commission to build the plant. That figure rose to \$515 million in a 2013 filing and could rise further as more is learned about the plant during operations.

The US Department of Energy (DOE) is awarding up to \$80 million for a six-year project to design, build, and operate a 10 MWe supercritical carbon dioxide (sCO<sub>2</sub>) pilot plant test facility in San Antonio, Texas. The project will be managed by a team led by the Gas Technology Institute (GTI), Southwest Research Institute, and General Electric Global Research.

# China continues Latin America expansion

- CTG now largest private generator in Brazil
- Growth prospects brighten

China Three Gorges (CTG) Corporation has further expanded in Latin America with a deal to acquire Duke Energy's 2090 MW business in Brazil for \$1.2 billion.

The deal makes CTG the leading private energy generator in Brazil, ahead of Engie, with an installed capacity of 8270 MW. It comes as prospects for a recovery in Latin America's largest energy market appear brighter after a period of uncertainty brought by political turmoil and an economic downturn comes to an end.

CTG's purchase includes eight hydroelectric plants plus two small hydroelectric plants in São Paulo and Parana states. Duke said that the sale would enable it to reduce Duke Energy's holding company debt.

CTG is also bidding for a major stake in Brazil's fourth largest energy generator, Santo Antonio Energia SA, which is developing a 3150 MW hydropower plant on the Madeira River.

CTG and other Chinese firms, including State Grid Corp., view Brazil as a key platform for growth due to the size of the economy, strong trade ties, growing energy demand, and rich hydro and wind energy resources.

The country could also serve as a springboard for investment in other South American countries, where prospects for growth are improving.

Banking firm Macquarie released a research note last month indicating a 3-4 per cent annual power demand growth in Latin America for 2017-18 after a period of low growth levels, and contraction in some markets.

Investors in Brazil have also been buoyed by the pro-business stance taken by President Michel Temer since the impeachment of Dilma Rousseff.

Temer has announced plans to increase asset sales at state-run energy firms, including Eletrobras, as well as plans to privatise seven Eletrobras-owned distribution companies.

# US Clean Power Plan scrutinised in court

US judges are deliberating legal arguments over the validity of President Barack Obama's Clean Power Plan following a lengthy court hearing in September.

Lawyers from 27 US states and coal-reliant energy firms are seeking to halt plans by the Obama Administration to use the Clean Air Act of 1970 to regulate greenhouse gas emissions from coal and gas fired power plants.

The plans are a key component of Obama's plan to tackle climate change and a commitment to reduce greenhouse gas emissions by 26-28 per cent below 2005 levels by 2025.

But opponents of the Clean Power Plan say that restricting the use of fossil fuels will harm the economy and lead to higher energy costs for consumers and manufacturers. They claim that the Environmental Protection Agency (EPA) has overstepped its authority under the Clean Air Act, and that the

plan would lead to "double regulation" of sources that are already controlled.

They have also argued that the plans violate the Tenth Amendment to the US Constitution, which protects the powers of the states.

Some 18 other US states and a raft of business, citizen and environmental interest groups have registered their support of the Clean Power Plan.

The US Environmental Protection Agency (EPA) proposed the Clean Power Plan in 2014, and finalised it a year later in August 2015. In February 2016, five justices of the Supreme Court voted to suspend the implementation of the plan pending the resolution of the lawsuit against it.

The case was heard by a panel of 10 judges at the US court of appeals for the District of Columbia circuit. A ruling is expected late this year or early next and the case is likely to go before the Supreme Court.

# Argentina prepares for second renewable auction

Argentina is preparing to hold a second renewable energy auction following completion of a successful first round in October.

The government said last month that the first RenovAR auction awarded a total of 1.1 GW of renewable energy projects. A second round – Round 1.5 – is scheduled for November.

Argentina has set a goal of increasing the level of renewable energy in its energy mix from two per cent currently to eight per cent by the end of 2017 and 20 per cent by 2020.

The RenovAR auction awards included 400 MW of solar energy projects. These include the 300 MW Cauchari solar farm in Jujuy province, divided into three 100 MW lots. In total, developers submitted bids for some 123 projects amounting to 6 GW of capacity.

The government estimates that the 1.1 GW of renewable energy projects awarded represent an investment of \$1.8 billion, and the median price of the auction was around \$59.6/MWh. Some 90 per cent of the projects

awarded were solar or wind farms.

RenovAR was launched in May 2016 and focuses on developing clean sources of energy, including wind and solar power. This will help the country improve energy security as well as reach climate change targets.

A partnership of Power China, Shanghai Electric, and Talesun will develop the \$340 million Cauchari solar farm. A fourth solar project – the 100 MW La Puna project in Salta Province – was also awarded. Some 12 wind farms were awarded.

# Mexico lures international investors

Some \$4 billion of investment is expected in Mexico's electricity sector following the country's second electric power auction.

International firms including Enel Green Power and Engie won contracts alongside local and regional energy companies to develop 2871 MW of new generating capacity.

A total of 66 companies qualified to bid in the auction; 57 submitted offers and 23 were awarded contracts. A

total of 8909 GWh was awarded, of which 54 per cent corresponds to photovoltaic plants and 43 per cent to wind farms.

The average bidding price was 44.2 per cent below the maximum price set by the Federal Electricity Commission (CFE).

Acciona Energia, in a joint venture with Mexico's Tuto Energy, won a contract for the supply of 478 GWh of renewable energy generation and

the corresponding amount in clean energy certificates, or CELs. The contract will allow Acciona to build its first solar plant in Mexico, a 227 MWp PV farm in Sonora state.

The Mexican business unit of EDF Energies Nouvelles secured off-take contracts for 252 MW of wind and 90 MW of solar power, while Energía Sierra Juárez Holding will construct a 41 MW solar park in Baja California state.



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# Vietnam urged to focus on renewables

- Carbon dioxide emissions rising by 10 per cent annually
- Mainstream and GE to develop wind power plants

Syed Ali

Vietnam is being urged to favour renewables over coal in order to meet its climate change commitments.

The Economist Corporate Network (ECN), a networking group for business leaders within the Economist Group, warned that the country's existing policy to develop more coal-fired power plants, without incentives for renewable energy development, is making the country one of the biggest greenhouse (GHG) emitters in the Southeast Asian region.

According to the Siemens-sponsored ECN report 'ASEAN in a climate of change: spotlight on sustainable energy in Malaysia, Thailand, and Vietnam', released in October, Vietnam's

carbon dioxide emissions have been rising at a consistently rapid rate over the last decade.

At the COP21 climate change meeting in Paris last year, Vietnam committed to reducing its GHG emissions by 8 per cent by 2030 – a target that could increase to 25 per cent with international support. However, between 2006 and 2015, energy-related CO<sub>2</sub> emissions have risen by an annual average of 10 per cent, due to rapid growth in its economy and energy consumption.

Currently, Vietnam has 19 coal-fired power plants. The government has announced plans to build another 14 similar plants in the Mekong Delta by 2030, adding a total capacity of about 18 000 MW of coal fired generating

capacity to the power-hungry south.

Andrew Staple, ECN's director for Southeast Asia said: "The best way for Vietnam to limit its emissions and accomplish its international commitment to reduce its GHGs is to limit the development of coal-fired power sources and create attractive renewable energy policies for private investors."

Vietnam's use of renewables, apart from hydropower and traditional forms of bioenergy for domestic use, is negligible. Under its Power Development Plan VII, coal will account for over 50 per cent of power generation capacity by 2030 (renewables and hydro combined would account for 28 per cent by that year).

Pham Thai Lai, President and CEO of Siemens Ltd Vietnam stressed that now is the time for Vietnam to create incentives to attract renewable energy investors. Other industry experts agree. Gavin Smith, director of Dragon Capital's Clean Development Fund and vice chair of Eurocham Vietnam, said: "While there is a high-level commitment to renewables [in Vietnam], there has not yet been the change in policy that would facilitate clean energy investment."

The country's Sustainable Development Strategy 2011–2020 identifies clean and renewable energy development and its growing share in Vietnam's energy consumption mix as priorities for a sustainable economy. Notably, Vietnam has abundant wind resources, which could make a significant contribution to increasing this share. Vietnam's Power Master Plan VII foresees increasing annual wind power generation from 194–210 GWh in 2015 to 330–362 billion GWh in 2020.

In May, GE and the Ministry of Industry and Trade signed a 1 GW initiative to accelerate large-scale wind project construction. More recently, in a move to complement that agreement, Mainstream Renewable Power and GE Energy Financial Services signed a term sheet to develop, build and operate large-scale wind power plants in the country.

The projects, expected to comprise both greenfield and partially developed sites, will see co-operation with local and international developers, and receive financing through a Mainstream and GE Energy Financial Services joint development agreement.

## Indian electrification by May 2017

All Indian villages will have an electricity connection by May 2017 – a year ahead of the 1000-day deadline set by the NDA government – Union Minister Piyush Goyal has said. The Union Minister of State (Independent Charge) for Power, Coal, New & Renewable Energy and Mines also announced soft loans to states for providing an electricity connection to every household in the country.

The progress has been accelerated by the deployment of rooftop solar projects as well as the ongoing development of the country's transmission and distribution networks.

The government's effort to increase the amount of energy from solar rooftop systems to 40 GW by 2022 was helped at the start of October month by the Asian Development Bank (ADB), which announced it will provide \$500 million in financing for rooftop solar systems. Rooftop solar is an important part of a wider goal under the Jawaharlal Nehru National Solar Mission to increase overall solar energy generation to 100 GW by the same date.

An important milestone in those solar plans was reached in October when the Adani Group opened a 648 MW solar plant in Tamil Nadu, south India. The project in Kamuthi, Ramana-thapuram, is the world's largest solar plant "in a single location", said the Gujarat-based company.

■ Last month India took a huge step in the development of its transmission grid with the announcement that ABB has developed, manufactured and energised a 1200 kV ultra-high-voltage power transformer to support its plans to build a 1200 kV transmission system, supplementing the existing 400 kV and 800 kV transmission grid as demand for electricity increases. India's geographic span means that resource-rich generation centres and urban and industrial load centres are often far apart therefore requiring efficient power transmission.

## PPA procurement keeps Indonesia on track

Indonesia's state electricity firm, PLN, has said its 35 GW power generation programme is on schedule, with the ongoing signing of power purchase agreements (PPAs) for nearly 10 000 MW of electricity from independent power producers (IPPs).

Reporting on the programme's progress, PLN President Director Sofyan Basyir said the PPA procurement is under way and predicted the process could be completed by the end of the year.

As of August 4th, PLN said project development contracts had been finalised for power plants with a combined capacity of 16 515 MW. Contracts for the development of the remaining 18 485 MW are expected to be finalised by the end of the year.

IPP projects will provide 11 730 MW

of the total, while the remainder will be from projects being built by PLN.

The 35 GW programme is aimed at improving Indonesia's electrification ratio to 97 per cent by 2019 from the current ratio of 88.3 per cent.

During the Future of Electricity Summit in late September, GE committed to funding a pilot project in Eastern Indonesia to showcase technology that can help electrify remote villages. This pilot supports the government's Bright Indonesia programme, which aims to electrify more than 12 600 villages.

■ A consortium led by state energy company Pertamina has won the bid for a \$2 billion contract to build a 1600 MW power plant Java-1 in West Java, state utility company Perusahaan Listrik Negara (PLN) said.

## Green energy to benefit first from Taiwan deregulation

The supply of "green" energy will be the first to be opened up to all companies, as Taiwan moves to deregulate its electricity market.

In October the Executive Yuan passed an amendment of the Electricity Act that would deregulate the power market and promote renewable energy. It is the first part of steps being taken to liberalise the power market and break up state-run Taiwan Power Co (Taipower).

According to the draft amendments, renewable energy firms will be allowed to sell and transmit electricity to users directly, with pricing being freely negotiated between generating companies and clients, Bureau of Energy Director-General Lin Chuan-neng said. Currently, firms can only sell power to Taipower.

The Executive Yuan was planning an across-the-board liberalisation to deregulate both the traditional and

renewable energy markets, but the latest amendment is mainly focused on the "green" energy sector, Executive Yuan spokesman Hsu Kuo-yung said.

The traditional power sector would be liberalised in the next round of legislation to allow operators to freely enter electricity retailing, Hsu said.

The "public electricity retailing industry", which is to be composed of Taipower spinoffs, would be obliged to supply power to the public, which will also have the choice to purchase "green" energy, he said, adding that "non-renewable" electricity rates would be regulated to offset price fluctuations due to global fuel costs.

"The government has adopted a gradual approach to liberalisation to prevent the legislation from being stalled," Hsu said.

The legislation is necessary as Taipower's monopoly of the industry is

prohibiting rapid growth in the renewable energy industry, said Premier Lin Chuan, adding that it is the government's priority to liberate the green energy market during this legislative session.

"The percentage of green energy in the nation's power grid is too low and even if the price of green energy increases several times over [following the liberalisation], it would not affect electricity supply," Minister of Economic Affairs Lee Chih-kung said.

The country's renewable energy efforts received a further boost last month with the announcement that GermanSolar Asia Co is teaming up with French solar energy firm Ciel & Terre to set up Taiwan's first floating solar plant at Agongdian Reservoir in Kaohsiung.

In the first stage, the project is expected to generate 2.4 GWh of electricity per year.



# UK leans on gas as coal generation slips

■ Solar eclipses coal for first time ■ Winter margins assured by National Grid contracts

Siân Crampsie

A sharp rise in solar generation has pushed coal fired power plants out of the picture in the UK's electricity system, new data shows.

More power came from solar panels than coal fired plants in the six months from April to September 2016 for the first time, while data from the UK's Department for Business, Energy and Industrial Strategy (BEIS) shows that gas is helping to fill the gap.

The trend is leading to increased price volatility as well as tighter sup-

ply margins during evening periods with low wind levels.

BEIS data shows that coal only generated 5.8 per cent of the UK's electricity in the second quarter of 2016 compared to over 20 per cent a year earlier. Analyst firm Carbon Brief says that an estimated 6964 GWh were generated by solar over the half-year – 5.4 per cent of the UK's electricity demand.

Solar had already eclipsed coal for a day in April and then for the whole month of May, with coal providing zero power for the first time in more than 100 years for several days in May, according to Carbon Brief. In the

April-September period, coal produced 6342 GWh, or 4.7 per cent of electricity needs.

The UK generated around 45 per cent of its electricity from natural gas in the second quarter of 2016 says BEIS data – up from 30 per cent in the same quarter for 2015. This trend is set to continue thanks to the start of commercial operations of the 880 MW Carrington CCGT plant, and the numerous small-scale gas fired power plants that are either in planning or under construction.

A number of these small-scale, so-called "car park" plants have already

started operating in the UK and many more are planned as they are relatively quick to consent and build, and are able to win short-term contracts under the UK's capacity market scheme.

These plants generally use gas or diesel engines and have capacities of 50 MW or less, and have enabled developers such as Green Frog, Statera Energy and Plutus PowerGen to capitalise on gaps in the UK's energy market.

The UK is set to further rely on fossil fuels during the winter period, when contracts worth £122 million will keep coal and gas fired power plants on standby to help avoid blackouts and

maintain system stability, according to National Grid.

National Grid, the system operator, last month published its Winter Outlook report, forecasting that the margin between supply and demand over the course of the winter would be 6.6 per cent, an increase of almost 30 per cent on last year's cushion and wider than a provisional forecast made in July.

National Grid will pay for 10 coal and gas fired plants to keep capacity on standby. These include coal plants at Eggborough in Yorkshire and Fiddlers Ferry in Cheshire that had previously been earmarked for closure.

# TVO moves to avoid further OL3 delays

Teollisuuden Voima Oy (TVO) is taking steps to prevent further delays to the Olkiluoto 3 (OL3) nuclear power plant project in Finland.

The Finnish utility has started fresh legal action against Areva to ensure that the French nuclear firm's restructuring plans will not cause problems for the OL3 project, which is almost a decade behind its original schedule.

TVO says that it has already sought assurances from Areva, which is responsible for building the plant's nuclear island, that OL3 will remain on track to start operating in 2018. It has filed a case in Nanterre Commercial Court, France.

TVO announced last month that OL3 had reached two new milestones: the start of nuclear circuit cleaning and completion of full scope simulator testing. Circuit cleaning is one of the prerequisites for another project milestone – cold functional tests – planned for early summer 2017.

"These milestones are important steps towards completion of the plant. The OL3 EPR project has all of the prerequisites necessary to proceed as planned," explained Jouni Silvennoinen, Senior Vice President responsible for the OL3 EPR Project at TVO.

The finalisation of the main electro-

mechanical installations and plant finishing works are also underway, TVO said.

In a restructuring of the French nuclear industry, Areva is due to sell its nuclear power plant business to EDF. The OL3 project will be handed to another legal entity, however, in order to protect EDF from further liabilities associated with the project. TVO is also concerned about a European Commission investigation into the financing of Areva's restructuring.

Reuters reported in October that Areva had given assurances that the restructuring will not harm the Finnish project.

# Grid communications demonstrates smart possibilities

UK smart grid firm Reactive Technologies says that a project demonstrating the use of the electricity grid for communication purposes marks a "significant step towards a smart energy revolution".

Reactive teamed up with National Grid and SSE to show how data can be transmitted via the power network using a unique communications technology. The world-first project shows how connected devices could share information and how remote control and measurement of electrical assets across electricity networks could be achieved.

Reactive's Grid Data and Measurement System (GDMS) technology enables electrical assets and other devices connected to an electricity network to communicate without the need for a cellular or internet connection. It offers the possibility of creating large-scale smart grids, and could give utilities a better insight into the behaviour of prosumers.

It could also give utilities a clearer picture of how electricity is generated and consumed at the distribution network level. Such information is essential for operators tasked with balancing electricity networks, which are becoming increasingly complex due to the variety of assets connected to them such as distributed generators, electric vehicles and batteries.

"National Grid signed up to the

scheme as part of its work to support innovative ways to help balance supply and demand and also provide benefits to customers," said Cordi O'Hara, Director of UK System Operator, National Grid. "Technology that allows devices to communicate quickly will help encourage 'demand side' solutions that encourage efficient use of energy and will increasingly become part of the way the grid is managed."

O'Hara added that the project had demonstrated the successful transmission of data through the electricity grid over long distances, critically passing through transformers and with a broad coverage.

"In GDMS, our communications engineers have invented a truly disruptive technology which has the potential to benefit many stakeholders across the energy supply chain," said Marc Borrett, CEO for Reactive.

Reactive also said that GDMS could enable utilities to implement demand side response (DSR) programmes. "Creating flexible demand is the lowest cost and carbon free way of balancing the electricity system which is otherwise managed by turning up or down thermal power plant like diesel generators or gas fired power stations," said Jens Madrian, CFO and CCO of Reactive. "GDMS offers a new cost-effective way to create flexible demand at scale."

# Pellworm demonstrates renewables potential

The ability of renewable energy coupled to a smart grid to meet the power needs of an entire region has been successfully demonstrated in Germany.

The Smart Region Pellworm research project, on the island of Pellworm in northern Germany, linked renewable energy sources and battery

storage systems to a smart grid. The project is about to enter its second phase, according to E.On, having successfully demonstrated a secure and stable power supply in its first phase.

The second phase of the project will focus on optimising the economics, which remain "a challenge", E.On

said. It will also explore new business models on the North Sea island to find a way of making battery-based power solutions commercially viable.

Improved system performance, greater economies of scale and price discounts are expected to compensate for the high capex of the storage systems.

E.On teamed up with grid operator Schleswig-Holstein Netz AG, the two Fraunhofer institutes IOSB-AST and UMSICHT, power systems manufacturer Gustav Klein GmbH & Co. KG, battery manufacturer Saft Batterien GmbH, the Fachhochschule Westküste as well as RWTH Aachen University to implement the project.

German utility WEMAG and storage software firm Younicos have started construction on a project that will nearly triple the storage capacity of its Schwerin 2 battery park. The project will double the utility's storage resource from 5 MW to 10 MW, while the energy capacity will increase from 5 MWh to 14.5 MWh.



# Private coal and gas projects will boost South Africa

■ Coal capacity set for construction ■ Gas-to-power plant details released

Siân Crampsie

Several private coal and gas projects are set to bring much needed additional capacity to South Africa's grid.

South Korea's Kepco and Saudi Arabian firm ACWA Power are set to add around 863 MW of coal fired capacity to South Africa's electricity grid after being named as preferred bidders for the construction of two new power plants.

South Africa's energy ministry has named Kepco as the preferred bidder for the 630 MW Thabametsi power plant, while ACWA Power has been selected as preferred bidder for the

306 MW Khanyisa project.

The two coal projects were tendered under South Africa's independent power producer (IPP) programme, which includes a coal programme designed to ensure the addition of baseload capacity to the system.

Kepco has formed a consortium with Japan's Marubeni Corporation to build the Thabametsi project in Limpopo province. It will be built on a 30-year build-own-operate basis.

According to ACWA, the Khanyisa project will be the first in South Africa to use circulating fluidised bed (CFB) boiler technology. Located in Mpumalanga Province, the plant will make use

of the discard coal abundantly available as waste piles in the nearby Anglo American collieries.

"ACWA Power has been fortunate to participate in both the Renewable Energy IPP and the coal baseload IPP program both of which are well structured and professionally managed, providing us confidence to invest for the long term in the South African energy sector," said Paddy Padmanathan, President and CEO of ACWA Power.

ACWA Power's local partners include Thebe Investments, Pele Natural Energy, Mazi Capital and Palace Group.

Both projects are scheduled to be

operational by December 2020.

The government has also given the go-ahead to two natural gas fired power plants at the ports of Richards Bay and Coega.

South Africa's energy ministry announced in October that it will seek bidders to manage the two new plants totalling 3000 MW of capacity.

The plant at Richards Bay will generate 2000 MW from LNG imports, while the project at the Coega industrial development zone will generate 1000 MW. Developers will sign 20-year power purchase agreements with Eskom, the ministry said.

The use of LNG imports will help

South Africa to reduce its dependence on coal for power generation. The plants will form part of South Africa's Gas-to-Power programme, designed to boost development of South Africa's gas industry as well as increase power generation capacity.

The projects will include the supply of gas, a floating storage regasification unit, port infrastructure, a pipeline to deliver gas to the new power plant, as well as the construction of the plants and its connection to the national grid.

There will also be the possibility of supplying gas to residential and commercial customers.

## Path cleared for first UAE nuclear plant

The Emirates Nuclear Energy Corporation (ENEC) and the Korea Electric Power Corporation (Kepco) have reached financial close on the Barakah nuclear project, paving the way for completion of the UAE's first nuclear power plant.

Kepco has agreed to put \$900 million of equity into Barakah One, the joint venture company set up to develop the nuclear power plant. Kepco expects the deal to boost its revenue by nearly \$50 billion over the next 60 years, according to a statement released by South Korea's energy ministry in October.

Construction of the 5600 MW Barakah nuclear power plant, located in Abu Dhabi, is now 70 per cent complete, according to ENEC, with the first unit 85 per cent complete and due on line in 2017.

"Most recently, we installed Unit 3's reactor vessel, completed the construction of the concrete dome for the Unit 2 reactor containment building,

and are progressing steadily through the testing and commissioning phase at Unit 1, where the structural integrity and integrated leak tests were recently completed," Mohamed Al Hammadi, CEO of ENEC told UAE state news agency *WAM*.

Barakah will cost around \$24.4 billion to build and will produce around one-quarter of the UAE's electricity needs. Financing comprises direct loan agreements of about \$19.6 billion as well as a total of \$4.7 billion in equity commitments from ENEC and Kepco.

Kepco will hold an 18 per cent stake in Barakah One. The plant is scheduled to be completed in 2020, eight years after construction began.

Direct loan agreements include \$2.5 billion from the Export-Import Bank of Korea, \$250 million of agreements with local and international commercial banks, as well as \$16.2 billion from the Department of Finance of Abu Dhabi.

## Turkey offers project development opportunities

Energy investors are turning to Turkey for project development opportunities as the market continues its reform efforts.

Saudi-based ACWA Power has announced plans to build a 340 MW wind farm in Turkey, while GE said it would invest \$20 million in upgrading an existing manufacturing facility in Gebze.

The International Energy Agency (IEA) recently praised Turkey for the progress it had made in reforming its energy sector, and said that completion of the reforms would enable the country to attract further investment and tap into its renewable energy and energy efficiency potential.

In its latest survey of energy policies of Turkey, the IEA said that the country has attracted substantial interest in the investor community thanks to privatisation and electricity market reforms.

It called on the government to continue down this path. "To attract more investments, the liberalisation of the energy markets needs to progress further," said Fatih Birol, the IEA Executive Director.

The IEA highlighted three avenues for reform: strengthening the independence of the system operators and regulatory authorities; abolishing market distortions in favour of market pricing; and continuing to invest in

more flexible and modern gas and electricity infrastructure.

"These pillars are critical for securing stable and reliable electrical power supplies and ensuring sustainable economic growth, and ensuring much needed diversification," the IEA said in its report.

Turkey's government said recently that it was preparing a solar energy tender. The IEA has warned Turkey over its high import dependency on oil and gas and the fast increase in carbon dioxide emissions, which have more than doubled since 1990. "Commendably, Turkey has for the first time set an emission reduction goal," the IEA said.

## Renewables help Jordan's energy security

■ 50 MW PV plant is "cornerstone" of Jordanian strategy  
■ IFC lends \$76 million for FRV plant

Jordan is continuing efforts to boost renewable energy capacity in a bid to improve energy security.

The country announced that the 52.5 MW Shams Ma'an solar project was commissioned on schedule by developer First Solar, and has also secured financing from the International Finance Corporation (IFC) for a 50 MW solar power plant in northern Jordan.

Shams Ma'an consists of over 600 000 thin film solar modules mounted on single axis trackers. It was developed by First Solar and is owned by a consortium of investors consisting of Diamond Generating Europe Ltd., Nebras Power Q.S.C. and the Kawar Group.

Shams Ma'an has a 20-year power purchase agreement with the National Electric Power Company (NEPCO) of Jordan.

Kawar Energy said that Shams Ma'an would serve as a "cornerstone of Jordan's energy security strategy".

Jordan imports most of its energy needs and is investing in nuclear energy as well as renewables in order to improve security.

Recently the IFC said it had agreed to a \$76 million financing package for Fotowatio Renewable Ventures (FRV) to build a new 50 MW solar photovoltaic (PV) power plant in northern Jordan.

The financing package, which includes \$21 million from the IFC-Canada Climate Change Programme, will support the construction of FRV's first solar power plant in Mafraq.

According to the IFC, the new plant will supply power at 6.9 cents per kilowatt-hour – a price far below Jordan's average cost of electricity and

among the lowest for solar energy worldwide.

"In Jordan, the demand for power is growing rapidly," said Mouayed Makhoulf, IFC director for the Middle East and North Africa. "Privately owned power companies, with their expertise and financial clout, have a vital role to play in bringing new generation capacity online at a lower cost which in turn will help the government to provide Jordan's economy with the energy it needs to grow."

The Mafraq plant is the first solar PV plant to be financed out of the four planned under the Jordanian government's second round of solar PV projects, said a statement from the IFC.

"This is our first plant in Jordan and the country has tremendous potential when it comes to renewable energy," said Tristán Higuero, COO of FRV.



## Companies News

# ABB keeps Power Grids in the fold

**Spiesshofer: strategic partnerships will help drive growth while mitigating risk**



ABB is continuing its strategic transformation but has resisted pressure to divest its Power Grids business.

Siân Crampsie

ABB says that it will retain its Power Grids division following a portfolio review.

The technology firm has come under pressure to break up its business but announced last month that a year-long strategic review concluded that Power Grids would perform better under its ownership.

It has initiated a new growth programme for the Power Grids division and has also announced strategic partnerships with Fluor and Aibel to help tap growth opportunities.

The review was part of ABB's Next Level strategy, under which it plans to restructure its business and improve financial performance. Last month ABB launched stage three of the strategy, announcing plans to shape its divisions into four market units.

"Over the last two years, ABB has become faster, leaner and more efficient," said ABB CEO Ulrich Spiesshofer. "We have continuously improved margins and further strengthened our cash generation. In stage three of our Next Level strategy, we are building on our successful transformation momentum and strength-

ening our position as a pioneering technology leader and global digital champion."

ABB said that it considered various options for its Power Grids division, including a sale, IPO or joint venture. Key factors in the decision-making process included market attractiveness, the existing and future product offerings, business model opportunities and best ownership, as well as all alternative value creation options for ABB shareholders.

It added that the "energy and fourth industrial revolution" is creating significant demand for Power Grid's

products, systems, software and services. To help realise the full potential of the Power Grids division, ABB has initiated a new programme, called "Power Up", to growth and enhance earnings accretion by focusing on core operational strengths and high growth segments as well as digitally enabled services and software.

ABB will also partner with Fluor in the large electrical substations market, and with Aibel in offshore wind connections.

"Strategic partnerships like this are a core pillar of our Next Level strategy and help us to drive growth while

mitigating risk," Spiesshofer said.

ABB's four units will be electrification products, robotics and motion, industrial automation and power grids. They will benefit from sales collaboration orchestrated by regions and countries as well as from the group-wide digital offering, ABB said.

"Entrepreneurial spirit is the base for our future operating model," said Spiesshofer. "Our four market-leading businesses, led by empowered entrepreneurs, will drive sustainable value creation, supported by regions and Group oxygen such as ABB Ability and our leading G&A cost level."

## GE's acquisition of LM Wind Power presents risk

- Deal gives GE its own blade manufacturing ability
- Analysts see risk to other wind firms

GE's move to strengthen its renewable energy commitments through a \$1.65 billion deal to buy LM Wind Power of Denmark could present a risk to some wind firms.

According to Macquarie, LM Wind generated revenues of €750 million in 2015 and is one of the world's largest independent blade manufacturing firms. Blade manufacturing is also a key bottleneck in the wind turbine supply chain due to the capex involved and the craft-like nature of the manufacturing process, Macquarie said in a research note.

GE's purchase of LM Wind therefore could present a risk to other wind turbine firms in the medium-term, particularly in GE's main markets of the USA and Latin America, said Macquarie.

The firm stated: "We believe weakness in the stock price for the European listed turbine OEMs... could be related to the risk of losing a key supplier of high quality blades if GE eventually decides to limit LM Wind's

exposure to other customers."

LM produces wind turbine blades for GE as well as rivals such as Gamesa, Nordex and Goldwind, with 13 manufacturing sites in eight countries. The deal will enhance GE's ability to serve the onshore and offshore wind markets, the US firm said.

The deal marks the latest in a string of acquisitions for GE and will accelerate its growth in the wind power business. Analysts expect LM Wind will continue to be run by GE as a standalone business.

GE said that the acquisition would increase efficiency in its turbine making business and help to drive down the cost of wind power.

■ Global wind turbine orders from 11 vendors in 29 countries totalled 13 477 MW in 1H 2016, according to Navigant Research. Vestas jumped ahead of Siemens in this second edition of Navigant's Wind Order Turbine Tracker to lead all vendors in turbine orders received, with 3528 MW in capacity.

## Oil firms boost green credentials

Several oil majors are investing in clean technologies to prepare for change in the energy sector.

ExxonMobil recently sought to reassure investors that it is taking action on climate change as oil firms come under increased scrutiny over their preparedness for the transition to a low carbon economy.

The US oil giant said in October that it believes the risks of climate change are real and require serious action, and finalised plans with FuelCell Energy to build and test a novel fuel cell-based carbon capture and storage system in the USA.

Exxon CEO Rex Tillerson said at a conference in London last month that applying a cost to carbon was the most effective way of tackling climate change. Exxon has been applying an internal carbon price of up to \$80/tonne over the last ten years in its investment decision, he said.

His comments are in part a response to accusations in the USA that Exxon has violated US securities laws by playing down the risks to its business posed by climate change.

Last month Exxon asked a federal court to invalidate a subpoena issued by New York Attorney General Eric

Schneiderman in relation to an investigation of its nearly-40 year history of climate research.

Exxon says that it has turned over nearly one million pages of documents to the investigation and that the investigation is becoming increasingly political and biased.

Other large oil firms are also investing in clean technologies to prepare for change in the energy sector. France's Total is investing in solar energy, biomass and energy storage and aims for a 20 per cent share of low carbon energy in its business portfolio by 2020.

BP meanwhile, is considering further investments in onshore wind in the USA in order to enhance the profitability of its portfolio there.

Exxon said last month that its proposed fuel cell CCS pilot plant would be built at the James M. Barry Electric Generating Station, a 2.7 GW coal and gas-fired power plant operated by Southern Company subsidiary Alabama Power.

The CCS technology uses carbonate fuel cells to concentrate and capture carbon dioxide streams from power plants. Exxon and FuelCell Energy announced in May that they would

collaborate on development of the technology.

Exxon says that the fuel cell carbon capture solution "could substantially reduce costs and lead to a more economical pathway toward large-scale carbon capture and sequestration globally". Current carbon capture processes consume energy, but carbonate fuel cells generate electricity and hydrogen while capturing and concentrating carbon dioxide streams, reducing the cost of carbon capture.

"The world's growing need for electricity makes it critical to continue finding affordable, scalable ways to reduce carbon dioxide emissions from power plants to mitigate the risk of climate change," said Vijay Swarup, Vice President for research and development at ExxonMobil Research and Engineering Company.

Exxon says that in 2015 it captured approximately 6.9 million metric tons of carbon dioxide for sequestration. It has spent nearly \$7 billion since 2000 on technology to reduce greenhouse gas emissions, including on energy efficiency, cogeneration, flare reduction, carbon capture and sequestration, and research on lower-emission energy solutions.

## Solar firm attracts equity funding

Oxford Photovoltaics has attracted £21.3 million of funding in the last 18 months to help it commercialise its perovskite solar energy technology.

The UK-based firm says that the latest round of funding has raised £8.7 million from a combination of new and existing shareholders and that it expects to attract further investment before the end of the year.

Oxford PV says that the funding will help it to extend its leadership position

in the perovskite field. Applied as a thin film layer in tandem with an active silicon cell, perovskite can boost cell output by around 30 per cent.

"Energy consumption is set to double within the next 20 to 30 years. Perovskite has the potential to radically improve the efficiency of solar PV and meet the world's energy demand into the future," says Frank Averdung, CEO of Oxford PV.

"Our technology has already demon-

strated the efficiency and stability necessary to engage commercially with major industry players and become a key part of enhancing solar energy supply in years to come," Averdung added. "This investment will support Oxford PV as we take large steps towards commercialisation."

A portion of the funding has already been earmarked to develop a demonstration line to showcase the technology to manufacturers.

**OEM stock price weakness could be related to the risk of losing a key blade supplier**





## 10 | Tenders, Bids & Contracts

### Americas

#### Geothermal win for MHPS

Instituto Costarricense de Electricidad (ICE) has placed an order with Mitsubishi Hitachi Power Systems (MHPS) for a 55 MW class steam turbine for a new geothermal power plant in Costa Rica.

Las Pailas II geothermal plant will be built in Guanacaste Province in northwestern Costa Rica, close to the Miravalles III geothermal plant.

Initec Energía, S.A., a Spanish engineering firm, will be in charge of engineering, procurement and construction management on the project. MHPS will supply the steam turbine and will also dispatch engineers to the site to provide technical advice in installation and commissioning. A generator, manufactured by Mitsubishi Electric Corporation, will also be supplied.

#### SaskPower orders Chinook components

SaskPower has placed an order with Siemens for key equipment for the Chinook power station in Canada.

Burns & McDonnell Canada is designing and building the combined cycle power plant, which will have a generating capacity of 350 MW and be located near Swift Current, Saskatchewan.

Siemens will supply one SGT6-5000F gas turbine, one SST-900 steam turbine, one SGen6-1000A generator, and one SGen6-100A generator.

#### Wärtsilä to supply 28 MW power plant to Brazil

Wärtsilä has signed a €10 million contract with Imetame Energia to supply a 28 MW natural gas power plant to UTE Prosperidade I in Brazil.

The power plant will be equipped with Wärtsilä 34SG engines and will operate on the "gas-to-wire" concept – i.e., where natural gas is converted to electric power close to the gas fields and transmitted to urban areas via transmission lines.

Imetame Energia is a small independent oil and gas company operating in Bahia, Brazil, where gas can be hard to monetize because of an under-developed gas pipeline network.

UTE Prosperidade I is the first of three planned power plants in the rural area of Bahia. The baseload power plant will supply energy to Brazil's national grid.

### Asia-Pacific

#### Gamesa grows

Gamesa is continuing its growth in the Chinese wind market through agreements with Zhongmin for the supply of 95 MW.

The agreement marks the introduction of Gamesa's new G114-2.5 MW turbine into China. The firm will supply 38 of the units to two wind complexes in Fujian province.

The turbines are custom-designed to withstand the extreme winds typical of this coastal area, which is often hit by typhoons, Gamesa said. It will provide 19 units for the Matoushan wind farm and 19 for the Wangmushan development.

The projects will be commissioned in the first quarter of 2018.

#### Toshiba to supply Malea hydro plant

PT Malea Energy has placed orders with Toshiba to supply equipment for the Malea hydropower plant project in South Sulawesi, Indonesia.

The 90 MW project is part of the Indonesian government's plans to expand generating capacity across the country and is due to start operating in 2020.

Toshiba's equipment deliveries will start in 2018.

#### Gobi wind farm opts for Vestas

Vestas Wind Systems has received an engineering, procurement and construction contract to build the 50 MW Tssetsii wind farm in Mongolia's Gobi Desert.

The Tssetsii wind farm, located approximately 540 km south of Ulaanbaatar in the Gobi desert in Mongolia, is a large scale infrastructure project being developed by Clean Energy Asia with finance from the European Bank for Reconstruction and Development and the Japan International Cooperation Agency.

The wind farm is Vestas' first major deal in Mongolia, and is expected to go online in late 2017.

#### Doosan secures \$880 million contract

Doosan Heavy Industries & Construction has secured a Won950 billion (\$836.64 million) contract to build a coal fired thermal power plant for Redondo Peninsular Energy Corporation, a private power provider in the Philippines.

The Subic Redondo power plant will consist of two coal fired units and will be built 130 km northwest of Manila. Doosan will be responsible for the engineering, procurement, and construction (EPC) of the project.

Construction of the first unit is due to start this year and will be completed in December 2020. Construction of the second unit will start in 2017.

The plant will use circulating fluidised bed (CFB) boiler technology.

#### Japanese firm opts for Valmet

A consortium of local and US firms has won a tender to build a 300 MW power plant in Yangon, Myanmar, according to an announcement by the Ministry of Electricity and Energy.

The tender was issued by the government earlier this year. A consortium consisting of local companies National Infrastructure Holdings and MCM Pacific, and US companies APR Energy and Ace Resources Group has been awarded the contract for the project.

Demand for electricity from Myanmar's largest city is rising fast – from 1050 MW in 2015 to 1250 MW in 2016 according to Yangon Electricity Supply Corporation.

#### US-Myanmar consortium wins 300 MW bid

JFE Engineering (JFEE) has placed an order with Valmet for the supply of a multi-fuel power boiler and flue gas cleaning system for a new power plant in Hachinohe city, Aomori prefecture, Japan.

In 2015, Valmet and JFE Engineering signed a long term cooperation agreement to enable joint growth in the Japanese energy market. The agreement combines Valmet's high efficiency technology solutions with JFEE's market presence and EPC abilities.

The boiler will be installed for MPM Oji Eco Energy Corporation (MOE) at the Mitsubishi Paper Mills Limited plant in Hachinohe city.

Valmet's delivery includes a biomass-fired 75 MWe CYMIC boiler and flue gas cleaning system.

### Europe

#### Gamesa completes upgrade

Gamesa says it has concluded a programme to upgrade wind turbine operations at 28 wind farms in Spain, Portugal, France and Poland.

The company has carried out an 'Energy Thrust' project on 872 MW of capacity owned by a French utility. The programme aims to boost average turbine output by up to five per cent and was applied on 850 kW and 2 MW units.

#### Prysmian scores Rentel deal

Tideway B.V., part of DEME Group, has awarded Prysmian Group a €13 million contract to supply inter-array cables and accessories for the 309 MW Rentel offshore wind farm in Belgian North Sea.

Prysmian will be responsible for the design, manufacture and supply of the 33 kV submarine cables in various cross-sections, together with the related cable accessories. The company will also provide the offshore cable termination and testing services.

The Rentel wind farm is located approximately 34 km from the Port of Zeebrugge and approximately 40 km from Oostende off the Belgian coast.

It will consist of 42 Siemens D7 type wind turbines and is the fifth offshore wind farm to be constructed within the Belgian North Sea.

#### Nordex gains strength in Germany

Nordex has won six new turbine supply contracts in Germany in the last month, it has announced.

In September the firm's customers ordered 17 multi-MW turbines in contracts valued at a combined €64 million, it said. The orders were dominated by low and medium-wind products, in which Nordex specialises in Germany.

The largest single project in September was the Hengeler-Wendfeld wind farm. This citizen-financed wind farm is composed of seven N131/3300 turbines installed on 134 m-high hybrid towers.

#### QOS partners with Conergy

Conergy Services GmbH, a European leading provider of operation and maintenance solutions, has chosen QOS Energy's software to manage its clients' European solar PV portfolio of 500 MWp.

QOS Energy says it will integrate the 500 MWp within the next six months. The deliverables include a dedicated set of pre-configured analyses, reports and operation and maintenance contracts.

The software solution provided by QOS Energy is able to retrieve data from any system – SCADA, data logger, plant or sensor.

The system is also able to exchange data with third party databases. "Data acquisition can seem quite simple but is a big challenge considering the heterogeneity of systems and communication methods in solar PV," said Jean-Yves Bellet, VP-CTO of QOS Energy. "It is a day-to-day commitment to ensure that our systems can import and display data, sometimes in real-time, from any system, sensor or acquisition system."

"This is a requisite step towards an even more complex process to transform a large amount of raw data into intelligible, accurate and powerful decision making tools."

#### Ofgem sets tender dates

UK's Ofgem will launch competitive tenders for offshore transmission licences for the 336 MW Galloper and the 660 MW Walney Extension wind farms on 27 February, 2017.

The two links are part of Ofgem's OFTO Tender Round 5. Ofgem will choose the most competitive bids from companies to own and run the transmission links to the offshore wind farms for 20 years.

#### Borssele plan attracts 26 bidders

The Netherlands Enterprise Agency (RVO.nl) has received 26 applications for the Borssele III and IV offshore wind sites, it reported after the tender closed on 29 September 2016.

The Borssele III and IV sites will house a minimum of 680 MW of offshore wind capacity. RVO.nl said it would evaluate the bids and plans to have the opening tender round reviewed before the end of the year.

Companies were allowed to file three applications in total – a single application covering both sites and one separate application for each individual site.

The tender is part of the Dutch wind energy roadmap, which targets a total of 4500 MW of offshore wind power in 2023.

### International

#### MHPS to equip Navoi 2

Mitsubishi Hitachi Power Systems (MHPS) has won a turnkey order to equip the Navoi 2 power plant in Uzbekistan. The plant will be located 360 km southwest of Tashkent, and will supply steam as well as electricity from 2019.

Together with Mitsubishi Corporation, MHPS will design, procure, and manufacture the main equipment including the gas turbine and steam turbine, as well as major auxiliaries including the air cooled condenser and gas compressor, and be responsible for marine transportation, and commissioning.

#### Doosan to build Saudi CCGT plant

Doosan Heavy Industries & Construction has secured a 1 trillion won (\$900 million) contract to build a combined cycle power plant in Saudi Arabia, the company announced.

Doosan will build a power plant in Fadhili, 80 km inland from the eastern port city of Jubail, to provide heat and electricity to the Fadhili gas complex.

The project, initiated by the state-run Saudi Electricity Company and Saudi Aramco, is scheduled for completion by November 2019.

Doosan has formed a consortium with Engie to participate in the project. Doosan will be responsible for engineering, procurement and construction, and designing the layout and commission the plants. Engie will coordinate project details with Saudi Arabian electricity companies and help finance the project.

#### Siemens equips Zadar VI

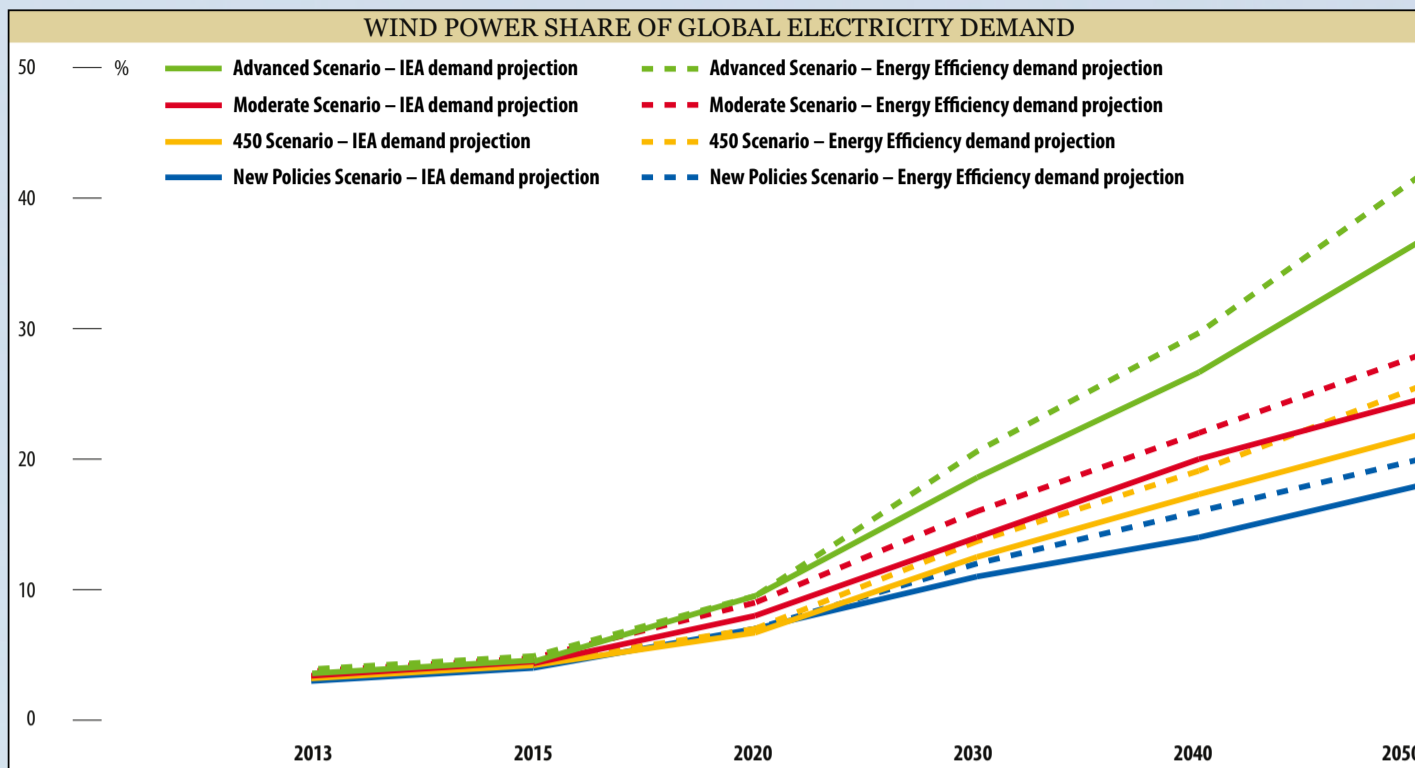
Siemens has been awarded a contract to supply the turbines for the 44 MW Zadar VI Extension onshore wind project in Croatia.

The German company will deliver and install 13 of its SWT-3.4-108 wind turbines on steel towers in the Lika region. The deal includes a long term service agreement for 14 years.

The Zadar VI Extension project is owned by Croatian company Postak d.o.o. Deliveries are planned for the first half of 2017, and commissioning for mid-2017.







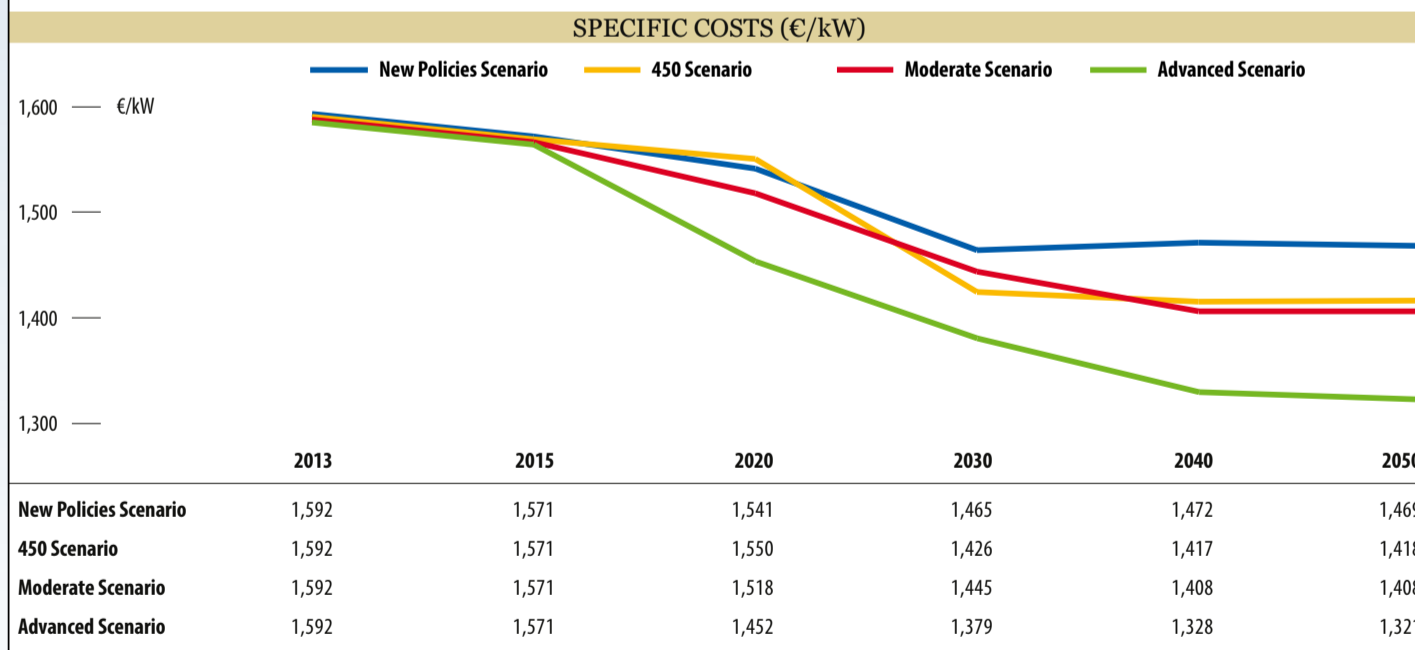
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Scenario	Projection Type	2013	2015	2020	2030	2040	2050
New Policies Scenario	IEA demand projection	3%	4%	7%	11%	14%	18%
	Energy Efficiency demand projection	3%	4%	7%	12%	16%	20%
450 Scenario	IEA demand projection	3%	4%	7%	13%	17%	22%
	Energy Efficiency demand projection	3%	4%	7%	14%	19%	25%
Moderate Scenario	IEA demand projection	3%	4%	8%	14%	20%	25%
	Energy Efficiency demand projection	3%	4%	9%	16%	22%	28%
Advanced Scenario	IEA demand projection	3%	4%	9%	18%	26%	36%
	Energy Efficiency demand projection	3%	4%	9%	20%	29%	41%



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## Oil

# Crude prices improve but questions remain over demand growth

- Oil demand “expanding at a healthy rate”
- Market will not re-balance until late 2017

David Gregory

For the first three weeks of October the price of Brent crude edged its way upward into the lower \$50/b range and West Texas Intermediate (WTI) settled at about \$1 lower.

Much of the improvement in prices came in anticipation of Opec reaching some agreement on production when it meets in Vienna in at the end of November. While there was no firm commitment from Opec oil producers to take action during their informal meeting in Algiers in September, the participants left the meeting in an optimistic mood, resulting in oil prices being put on an upward incline.

Since then, Opec's top producer Saudi Arabia has been arguing that the worst for the market is over and that fundamentals are allowing supply and demand to rebalance the market. However, the ‘rebalancing’ that optimistic crude producers see happening is one that will likely see crude move in a price range throughout 2017 of

\$50-60/b. This is about half of what the price was when Saudi Arabia announced in 2014 that it would maintain production for the sake of holding on to market share. This average is still far below the price needed by many Opec members to maintain a healthy budget, but the \$50-60/b price is what oil companies are saying they can work with, having put considerable effort into reducing costs.

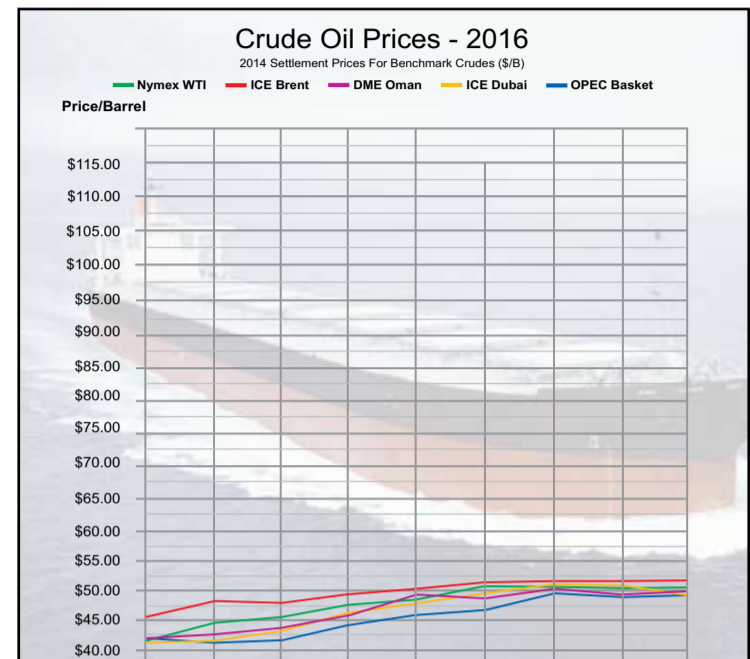
Saudi Energy Minister Khalid al-Falih said in mid-October that oil demand is expanding at a healthy rate despite slower global growth and added that by freezing or slightly reducing production Opec could indicate that it wanted to reduce inventories and encourage investment. But Saudi Arabia has in the past been accused of making statements to deliberately influence the market, and again, the Saudis might not be right on this one.

There remains plenty of crude available for purchase as Libya, Nigeria and now Kazakhstan, increase the volume

of crude they produce and export. Russian crude output hit a record of 11.11 million b/d in September, and while Moscow says it is willing to cooperate with Opec, it has indicated that it would prefer a production freeze rather than a cut. Tanker rates for crude shipments to Asia are reported higher, suggesting that demand for the additional oil on the market might not be there.

Another factor is that shale oil in the US is making its comeback as the number of rigs in operation slowly begins to rise. Shale producers, the original target of Saudi Arabia's efforts to move high-cost producers out of the market, have also learned how to cut costs. Should oil hit \$60/b, US shale oil producers are expected to come back hard.

The International Energy Agency (IEA) said in its September *Oil Market report* that oil demand growth is slowing at a faster pace than it had previous thought and forecasted a decline of 100,000 b/d in demand growth from the 2016 gain of 1.3 million b/d



that it forecasted a month earlier.

“We don't see the oil market re-balancing until late 2017,” Fatih Birol, Executive Director of the IEA said in September. Speaking to the media in October, Birol said the efficient use of crude would be another factor when it comes to determining demand.

“When you look at the markets, there are two important determinants: one is how much oil we produce, the other one is how much oil we consume,” Birol said in Istanbul during the World Energy Congress. “When you look at the consumption side, it is very important to see what kind of impact the fuel economy measures, energy efficiency measures, affect the demand and supply,” he said, adding that demand was slowing in China because of more efficient use of transportation fuel.

After a battering from two years of low oil prices, the industry is struggling

to find its feet again. One worry is what comes not just in 2017, but five years down the road.

Experts are pointing to the fact that billions of dollars' worth of upstream projects have been shelved because low oil prices do not justify investment. But the argument goes that unless sufficient investment is made the world could arrive at a time when demand far outstrips supply, a situation that would see prices skyrocket again. It is unlikely that the world could stomach that again.

High oil prices might have been good for the industry itself, but they created a situation where the price of everything else also went up as a consequence. One point to note is that despite this time of low prices, renewable energy projects bucked the theory that low oil prices would see less of them, instead we are seeing more.

## Gas

# TurkStream back in play after rapprochement with Ankara

Reconciliation between Russia and Turkey has brought the proposed TurkStream gas pipeline back into play. The development enables Russia to proceed with plans to bypass Ukraine as a gas transit route to Europe and provides Turkey with its second direct link to Russia's gas export system.

Mark Goetz

Russian President Vladimir Putin and Turkey's President Recep Tayyip signed an agreement in Istanbul on October 10 during a gathering of the World Energy Congress that allows for TurkStream to land in the European region of Turkey, from where it will feed into Turkey's gas grid and also proceed to the Greek border – and from there supply Southeast Europe.

Relations between Russia and Turkey had hit an unprecedented low in November 2015 after Turkey shot down a Russian jet that briefly crossed into Turkey while attacking rebel positions in Syria. The incident brought condemnation from Putin and economic and political consequences, including a halt to plans regarding the construction of TurkStream.

While Russia implemented economic measures designed to deprive Turkey of Russian markets, Russian

gas supplies were not questioned as Russia needs the Turkish market as badly as Turkey needs Russian gas, which accounts for around 60 per cent of the country's gas imports.

Turkey's increasing political isolation from its European and Middle Eastern neighbours in reaction to the war in Syria forced Erdogan to seek a reconciliation with Moscow, which Putin accepted.

TurkStream is Russia's alternative to the now defunct South Stream gas pipeline project which, like TurkStream, was designed to cross the Black Sea. South Stream would have made landfall in Bulgaria and from there pass through a number of Southeastern European countries into Central Europe. But the project met resistance from the EU because Moscow and state-owned Gazprom refused to abide by EU regulations established in its third energy package, which restricts an entity from owning both

production capacity and the transmission system. Furthermore, access to the pipeline would not have been provided to third party shippers.

With TurkStream, Russia hopes to avoid those problems by taking the pipeline only as far as the EU border.

Gazprom and Turkey's state-owned pipeline operator Botas signed a memorandum of understanding in December 2014 to build the pipeline, but the jet fighter incident interrupted the plan until this September when Gazprom received a permit to survey Turkey's subsea area of the Black Sea for two strings of the four-string pipeline system. The 900 km underwater pipeline will follow the South Stream path for some 600 km and then turn south for another 250 km to Kiyikoy in Turkey. The onshore section will stretch 180 km through western Turkey as far as Greece.

The first string will have a capacity to transport 15.75 billion m<sup>3</sup> (bcm)

annually of natural gas. This is similar to the capacity of the Blue Stream pipeline, which delivers Russian gas to northern Turkey via a subsea pipeline across the Black Sea. Gas transported through this string is designated for Turkey's domestic use. A parallel pipeline with the same capacity will be available for Russian gas shipments to Europe. Ultimately, Gazprom plans for the pipeline to have a capacity of 63 bcm/year.

Russia currently transports about 40 per cent of the gas it exports to Europe through Ukraine. This volume has fallen following Moscow's annexation of Crimea in 2014. The gas transit contract with Ukraine expires at the end of 2019, when TurkStream is scheduled to come into operation, and it is expected that Russia will insist that European customers agree to start receiving gas shipments through TurkStream. If this situation materialises, it could create some serious

supply gaps and possibly strengthen the EU's resolve to reduce its dependence on Russian gas. US LNG, which is keen on the European market, could come into play in such a scenario.

TurkStream will come into operation just as the EU-supported Southern Gas Corridor project nears completion. That project, which is being supervised by BP, will bring Azerbaijan's Shah Deniz gas to Southeastern and Central Europe by 2019-2020. The Southern Gas Corridor will run from Azerbaijan through Georgia, Turkey, Greece and Albania to Italy. Phase 1 of the project will deliver 10 bcm/year to Europe and 6 bcm/year to Turkey.

In the future, more Azeri gas will be shipped through the pipeline as it comes on-stream and other gas producers in the Caspian and Middle East might use the infrastructure, or add their own to it in order to make the Southern Gas Corridor a multi-sourced system, as is envisioned.



# The changing face of Europe's gas and power sector

In the shifting energy landscape, the smaller, nimbler mid-tier companies look better placed than the tier-ones to take advantage of market changes. **Harry Nota**

Everyone loves an underdog story: David vs Goliath, Leicester City versus everyone. It's such a well-worn narrative that we automatically look for it whenever we see any kind of big vs small scenario. However, there are times where it's actually the bigger player at the disadvantage, and the smaller competitor getting the rub of the green. In that situation, we should be careful about calling anyone an underdog – and the European gas and power sector in 2016 is just such a case.

The traditional gas and power sector landscape was relatively simple. National and regional power grids powered by large, centralised power stations burning some sort of fossil fuel to generate power – often coal. This landscape was perfectly suited to a few large national and international utility companies dominating the market. They had the scale to run the generation assets, the size and sophistication to trade fuel commodities in bulk and monopolies – or something close – gifted by geography. If you didn't like the price of power on the grid you were connected to, you couldn't very well buy from another.

This isn't to criticise the tier-ones – they did a very good job with the

tools and marketplace at their disposal for many decades – and they still do. However, that's no longer the grid of today, and as that picture fades to sepia-tone, it's often not the tier-ones best placed to take advantage of market changes. Instead, it's the smaller, nimbler mid-tier companies shaking off underdog status – the smart ones anyway.

The trends that these mid-tiers are taking advantage of are long-term

this could even lead to negative margins and spark an asset sell-off that competitors can take advantage of.

This hits hardest for the traditional tier ones that have spent decades investing in large fossil fuel power plants and is exacerbated for those that have failed to diversify since. By contrast, look again at the mid-tiers: they typically aren't as invested in large-scale fossil fuel generation assets and are much more likely to

easier adaptation to new energy trading regulations such as those in MiFID II; to the shorter-term trading cycle partially driven by renewables; to the increased portfolio diversity to manage.

If the tier-ones can retain these advantages while adapting to the new market landscape, there's no reason to think that they're on the way out. In fact, some of the biggest European utility companies have already demonstrated bold thinking on this front. 2016 was the year where E.ON split out its fossil fuel and nuclear business into a separate company, Uniper. RWE announced plans for something similar. Once again, 2016 seems to be the tipping point.

Writing from London, it would be strange to talk about the European gas and power market – especially its harmonisation – without a word on the UK independence referendum result.

With no firm plan on the table regarding the UK's desired future relationship with the EU, it's impossible to predict the future. However, there has already been a huge amount of investment in interconnectors between the UK and the rest of Europe, including Ireland. On the trading side, the UK may well stay signed up to most European regulations, or have to create its own equivalents as Switzerland has. Then there's the fact that more open, competitive market chimes with the UK's usual preferences.

So on balance, it seems as the UK may well continue down roughly the same path. Even if it doesn't though, there's no reason to think that the rest of Europe will change tack as a result.

So what's changed in the European gas and power market? Well, it looks more egalitarian and competitive than it has in a long time, and that can only be a good thing for consumers. The mid-tier energy companies have everything to gain if they can press their advantages and try to close the gap on their bigger rivals with regards to things like trading technology. The larger competitors by contrast can chisel out a place in this new world but it will take bold decisions and an investment in flexibility while retaining what advantages of scale they can.

As the market harmonises, the grid grows smarter and renewables proliferate, it's anyone's guess what the future holds. The balance of power has shifted though, and whichever way the narrative goes, it won't be an underdog story for the mid-tiers.

*Harry Nota is Head of Energy, EMEA, OpenLink, a provider of cross-asset trading and risk management products for energy and financial services companies.*

**Essentially, the name of the game is agility. Those less tied to large, immovable assets and able to take advantage of a broader generation mix are best placed to take opportunity where it arises.**

ones, but 2016 feels like a tipping point where a lot of stars have aligned. Nor does it look like the next few years will be a return to the old status quo.

One advantageous development for the mid-tier is the drive towards a single European power market, breaking down geographic monopolies. This is still very much a work in progress, but EU rules on market manipulation, gas pipeline use and energy trading have helped to break down barriers between and within member states. Harmonised cross-border trading rulebooks must be and gradually are being matched by physical infrastructure too. More interconnector and pipeline projects around the continent allow consumers to benefit from more stable, potentially cheaper energy prices.

These changes make it easier for challengers to gain market share as it undermines the natural monopolies of the older tier-ones. Lower overall prices also make it easier for nimbler, less asset-heavy companies to take advantage of cross-border trading without having to support large generation assets.

In 2016, we are doing well as a continent on this front, but there's work to do. The Balkan states, the Iberian Peninsula and the UK and Ireland are all natural outliers to a European grid. While there has been significant investment in UK and Irish interconnectors, huge opportunities exist in connecting Central and Eastern European countries to their Western neighbours.

Then there are those lower overall power prices. A single market contributes to this, but there's also the lower oil price and lower than expected demand to thank too. In any case, the net effect is extremely narrow dark and spark spreads. This disproportionately affects those power producers with large, expensive fossil fuel generation assets. Carbon pricing policies will squeeze margins further. In the worst cases,

have a more balanced 'pick and mix' portfolio with some gas here, some wind there and perhaps a sprinkling of solar. This reduces their exposure to dark and spark spreads relative to their overall portfolio.

For coal especially, this trend is unlikely to be reversed as carbon emission legislation ratchets ever upwards and decisions such as the UK's choice to phase out coal by 2025 take effect.

Essentially, the name of the game is agility. Those less tied to large, immovable assets and able to take advantage of a broader generation mix are best placed to take opportunity where it arises. As the grid gets smarter and more connected and power generation sources become cleaner and more diverse, this trend will accelerate. We'll look back at this year as a tipping point.

Of course, a favourable wind for the mid-tiers doesn't automatically translate into a storm for the biggest players. Nor should we wish it to be – as mentioned earlier – underdog narratives are tempting but not always helpful. The tier-ones have historically done a great job at delivering power and gas to consumers across Europe and they still have a major role to play.

Moreover, they have a number of advantages still intact which can help them weather any storm. Large companies typically have better trading functions, allowing them to play the markets to hedge their risks and lock in profitability. With most energy contracts still traded over-the-counter and off exchanges, there's also scope for using size and weight for negotiating better contracts. If not too leveraged on existing generation assets, they typically also have the best borrowing and spending power to invest in new renewable energy generation, meaning they too can diversify.

Then there's internal technological infrastructure – greater spending power in this department means



**Nota: We will look back at this year as a tipping point**



# Adapting to the prosumer era

Twenty years after the First Energy Package, Eurelectric believes the upcoming review of the EU electricity market design legislation is a unique opportunity to make sure that rules are future-proof for 'prosumers' to become an integral part of the power system.

**Hans ten Berge**

The power sector is undergoing one of the most profound changes in its history: the share of renewable energy sources is increasing, and we are moving rapidly towards a smarter power system where centralised and decentralised solutions including generation, storage and demand response all have a role to play.

Certainly, the future of the energy market in Europe will see an increasing presence of distributed generation, opening the way for consumers to be more and more involved in the power system. Consumers will be able to monitor their consumption via smart tools, choose among a broader variety of innovative energy services and produce electricity for their own use and sell it when needed, as 'prosumers' (producers/consumers).

As new technology enables major changes in the way the power sector works, new types of customers are emerging and these are generally more aware and demanding, more active and engaged.

In countries where market liberalisation has been completed, consumers have the possibility to select their supplier among a range of service providers. As the cost of distributed generation declines, consumers can

now also choose to produce part of their electricity themselves. While becoming active market participants, most prosumers remain connected to the power grid which guarantees them continuous supply of electricity by providing back-up when distributed generation is not available to meet their demand.

Smart grids are an essential element to intelligently integrate the behaviour and actions of all prosumers. Prosumers need to be able to send their electricity back to the grid, charge the battery of their electric vehicles, help the integration of larger shares of variable RES in the grid, and – by providing decentralised flexibility resources – contribute to avoiding costly network reinforcement.

consume, which is fair. However, the consumer avoids paying for the grid service, which they still use as a backup and policy support costs on this energy as well.

In other words, under this scheme, consumers use the grid as a backup system for their excess power production, which does not reflect that this electricity provides to the system. This would lead to higher retail prices for the supplier's remaining customers: the prices will go up because grid costs and levies will be recovered from a smaller consumer base. The association of European energy regulators CEER also recommended in their recent position paper on self-generation that Member States abandon non-market-based net metering

per cent of their bill to cover for taxes and policy support costs, 27 per cent for network charges and only 37 per cent for the electricity part of the bill. As these costs are often charged in €/MWh, when prosumers self-consume 1 MWh of their own electricity they contribute much less to the overall welfare, shifting some of the costs to the other consumers.

Regarding the policy support costs, Member States should seek ways to free the electricity bill of the policy support costs, including shifting the burden from electricity payers to taxpayers and spreading the cost of decarbonisation over different fuels, not just electricity. Regulation should also ensure that the way the regulated parts of the bill are charged does not give artificial investment signals that result in a massive shift of costs to other consumers and discouragement of electrification, which will be one of the key tools towards the decarbonisation of the economy.

Policy support costs could for example be charged with a mix of €/kW and €/kWh depending on consumers or prosumers' consumption volumes and patterns. This will require additional analysis on the way network tariffs are designed because they should reflect the value of the network to all those connected, to ensure a fair contribution by all consumers. The recovery of the fixed costs of building, operating and maintaining networks should also be well articulated. One possible way to improve the situation could be to evolve towards more capacity-based network tariffs to ensure that all customers pay for the grid they use.

Last but not least, in order to better integrate final consumers into the system, retailers should have the possibility to develop innovative products such as retail offers linked to wholesale market prices fluctuations (i.e. dynamic pricing) that give signals for shifting consumption. Besides the possible shift to more capacity based regulated charges as described above, a more dynamic approach to network tariffs, to reflect the situation in the grid, and to policy support costs should also be further investigated.

To allow for the energy revolution to be carried out in the most cost efficient way, consumers, energy companies and policy makers have the responsibility to help designing a regulatory framework which is adapted to the needs of the moment, but also to the challenges ahead.

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

**Adequate metering data is an enabler for prosumers to become more active and choose among a wider variety of services that energy companies could offer... in Finland about 20 out of the 70 retailers buy excess electricity from prosumers.**

Smart grids need to be coupled with a timely roll-out of smart meters. In this context, adequate metering data, with granular enough reading intervals, is another enabler for prosumers to become more active and choose among a wider variety of services that energy companies could offer, like, for instance, taking care of balancing responsibilities on their behalf. By way of example, in Finland, approximately 20 out of the 70 retailers buy excess electricity from prosumers. Subsidies, price regulation or purchase obligations are not applied. In addition, smart meter roll out has been completed and all generators have balancing responsibility.

Various means to provide indirect support to distributed generation are applied in Europe today. Technologies have developed, and distributed generation has increased significantly since the adoption of these schemes, creating a need to adapt the regulation to the new circumstances. Indirect support for distributed generation (such as non-market-based net-metering schemes) hinders the market integration of prosumers.

By net-metering schemes we mean schemes allowing the prosumers' meter to run backwards when the excess electricity that has been produced is fed into the grid. In other words, remuneration of prosumers' excess production is done at the retail price. In this way, the consumer avoids paying for the electricity that he did not

solutions.

In addition to indirect support, many European countries continue to apply direct support for small-scale power generation. Where the support for mature renewables is present, it should be done in the most cost-efficient and market-based way, minimising distortions. Even though individual installations may be small in size, when taking their market shares in total, this may comprise a significant portion of the power generation capacity. Operating aid (€/MWh) distorts the signal provided by the wholesale market price and leads to the inefficient operation of power generation. It also reduces the incentives to forecast RES generation accurately and to invest in flexibility. In view of this, investment aid should be considered as a preferable form of support.

Beyond these innovations, the current incentives/signals for prosumers to invest in their own generation or storage assets and to operate them need to be further clarified to ensure balanced incentives across the overall energy system.

In many countries the electricity bill is used to recover a number of regulated costs, such as network costs and policy support costs (levies), as a way to support decarbonisation, which, instead, can be more efficiently financed through a market-based ETS or general taxation.

Today European households pay 36



**Hans ten Berge:**  
retailers should have  
the possibility to  
develop innovative  
products



## Technology

# Driving the energy revolution?

Fundamental changes happening in the electricity sector present new challenges and opportunities for energy companies, networks and consumers. Electric vehicles are seen as one of the challenges, but could also be part of the solution.

**Siân Crampsie**



The COFAST project is based around the use of small-scale gas engines producing electricity for EV charging as well as heat

As the uptake of electric vehicles (EVs) on the roads rises, the interaction between the transport and electric power sectors is set to increase.

There are now an estimated 500 000 plug-in electric vehicles (PHEVs) on Europe's roads, and this number is expected to increase to over 8 million by the end of 2020 in line with efforts to decarbonise the transport sector.

According to the European Environment Agency (EEA), increased numbers of EVs will have a number of impacts, including a reduction in emissions from the transport sector, as well as an increase in electricity demand.

In a recent EEA report, the demand share of EVs in total electricity demand will reach levels of 4-5 per cent in several European countries by 2030, and could reach over ten per cent in most European nations by 2050, depending on EV penetration in vehicle stock. An 80 per cent car stock penetration would require up to 150 GW of additional power generation capacity, EEA says, with investments in renewables technologies particularly desirable.

EV uptake will also have an impact on electricity grids, most notably because large numbers of charging stations will put local networks under pressure. The impacts will vary from

area to area but are most likely to be felt in urban regions and rural areas, where networks tend to be weaker, or already under pressure from renewables integration.

Technologies to overcome these challenges are already being developed, according to Arshad Saleem of KIC InnoEnergy, including vehicle-to-grid (V2G) technologies that can turn EV fleets into a resource for energy storage and grid services.

Using V2G technologies will enable EVs to undertake services such as frequency regulation, supporting cheaper and more environmentally friendly grid balancing compared with fossil fuel power plants, said Saleem. They could also enable greater renewable energy integration by providing back-up energy storage, as well as perform peak shaving services. It is also expected that V2G technologies will attract new players to the energy value chain with business models focusing on the circular economy and enabling digital platform, Saleem explained.

The true potential of V2G technologies is not yet fully understood, however, as the concept has only so far been applied in research contexts, according to the EEA.

One of the main constraints of deploying V2G technology is in the increase in charging cycles that will lead to a higher degradation of EV batteries. And as batteries are a major cost factor of electric mobility, the use of EVs as a storage resource is not likely to be economically viable, especially as there are other, more viable energy storage technologies available.

Successful use of V2G technology would also require investment in electricity networks as well as "smart charging", where charging is controlled by the distribution network operator (DNO) rather than the user. A smart charging approach would require a sea-change in attitudes from not only the consumer, but the DNOs also, says Elisabeth Blunsdon, energy specialist lawyer in Orrick's energy and infrastructure practice.

"DNOs are not proactive organisations and are not designed to be," said Blunsdon. "They are regulated and their licenses dictate what they can and cannot do.

"Consumers also have to be on board with the potentially large volume of data collection that could be required [by V2G services] – for example how much and how often you use your EV – I can see people getting really worried about that."

Another issue is regulation and policy, notes Blunsdon. "There's quite a lot that needs to happen at the regulatory levels for things to happen. EV batteries are a potentially huge resource and if we can get transport and energy policy to line up then we can put that resource to use.

"One of the issues," continues Blunsdon, "is that DNOs don't have any visibility of storage behind the meter at all as it's not regulated." This could be a particular problem in areas where grids are weaker, Blunsdon says.

Reducing the impact of EVs on grid performance is another key area of development for the EV sector.

According to Saleem, one of the most obvious challenges of EV uptake is significantly increased electricity demand at low and medium voltage levels caused by a rise in the number of fast charging stations. This increased demand could result in network reliability issues including harmonics and distribution grid congestions.

Fast charging facilities will likely become a necessity for many types of EV fleets and will help users to alleviate the so-called range anxiety of EVs. However, the ability of existing grid infrastructure to support EV charging varies widely. In some areas, distribution systems are already weak or overloaded and power quality problems already exist. Distribution transformers could become heavily loaded thus increasing the likelihood of equipment failure, potentially blacking out entire suburbs.

KIC InnoEnergy is therefore supporting a project specifically designed to boost the number of EV fast-charging stations using a standardised solution based on small-scale cogeneration systems.

The project is being spearheaded by Spain's GNF and includes Cinergia, Sige and Pasch. It is designed to demonstrate how EV fast-charging stations could be deployed rapidly and economically using the natural gas distribution as a key

resource, rather than relying on the electricity network.

Known as COFAST, the project is based around the use of small-scale (142 kW) gas engines producing electricity for EV charging as well as heat. GNF proposes that the stations be installed in locations such as shopping centres, hospitals or hotels, which can make use of the heat and surplus electricity generated.

The advantage of the concept is that it enables fast charging stations to be installed in urban or semi-urban areas where grids are congested or weak, or even in rural areas where grids would need strengthening to otherwise accommodate an EV charging station.

In addition, says GNF, the concept is energy efficient, as the use of residual heat provides an energy saving and CO<sub>2</sub> emissions reduction when compared with the most common solution consisting of a charger connected to the distribution network and heat generated via gas boilers.

The COFAST project is about to enter a demonstration phase in Barcelona at the expo centre. The demonstration will run for up to a year, enabling GNF to gather data and validate the concept. "GNF is looking to take COFAST forward to other markets around the EU after the concept is verified," says Saleem.

Saleem added: "GNF is also verifying a new business model, as this project presents it with an opportunity as a new type of energy company, known as ESCO 2.0."

ESCO 2.0 business models are based on the involvement of prosumers and advanced energy performance contracts that can not only enable energy savings but also help network operators to enhance grid performance and flexibility. In the future, EV charging stations could have a role to play here, explains Saleem.

"EVs and charging stations are effectively a form of mobile energy storage and could become a hub for the provision of other services," said Saleem. "This is very interesting for us at KIC InnoEnergy and we already have start-ups in our portfolio who are developing flexibility services and the more EVs and charging stations there are, the more services they can offer."

A large numbers of charging stations will put local networks under pressure







Junior Isles

# A new beginning?

There is a school of thought that goes: if you say something often enough, it will come to pass – essentially a self-fulfilling prophecy. Perhaps this was the thinking behind the messages delivered at the European Turbine Network's 8th International Gas Turbine Conference, which recently took place in Brussels, Belgium.

The overall sentiment at the conference was far more positive than might have been expected, considering the difficulties facing gas fired generation in Europe.

In recent years, pressure from renewables and weak electricity demand has hit fossil fuelled generation hard. And low carbon prices, together with the lower cost of coal, has seen gas pushed further down the merit order in some countries, with gas being relegated to largely a peaking role.

In her opening keynote Tomi Motoi, with the Economics and Investment Office of the International Energy Agency (IEA) and one of the authors

of the IEA's recent *World Energy Investment 2016* report, presented some of the report's key highlights related to gas fired generation.

She noted that the power industry is at the start of a transition that is reshaping the asset base towards renewables but said gas would play a "very unique role" within this system. According to the IEA, renewables investment took nearly one fifth of the total share of power generation investment in 2015.

Notably, however, there was no investment in gas fired generation in the EU. The report states that there have been no Final Investment Decisions on new gas fired plant in the EU since 2013.

"Investment in gas fired generation in the EU crawled to a halt last year," said Motoi, "and there were only 6 GW of gas fired plant under construction in the EU."

Yet she maintained that gas fired generation would maintain "a key and leading role" as we transition to a low carbon energy system.

If gas, however, is to play a key role as the IEA and others predict, it will not be without its challenges.

In the power sector, the greatest challenge will be the growth of renewables. The IEA says the EU's non-hydro renewables share will reach nearly 40 per cent by 2040, squeezing fossil generation out of the mix. Motoi said: "In some markets it will also depress the wholesale prices, making it difficult for gas fired generators to recoup their capital costs."

Motoi added: "Due to strict targets for decarbonisation, coal will reduce to just 6 per cent of the generating mix in 2040 down from 22 per cent today."

So decarbonisation presents both opportunities and challenges. With this dramatic fall in coal fired generation, combined with the massive growth in renewables, the IEA expects that some 60 GW of gas fired plant will be added in the EU by 2040 as gas moves from a base load asset to take on the role of balancing intermittent wind and solar generation.

Nikolaas Baecklemans Vice-President-European Union Affairs, Exxon-Mobil presented an even more optimistic forecast for gas. In presenting the company's *Outlook for Energy: A view to 2040*, he said: "The industry will shift to lower carbon fuels. We see significant growth in renewables and nuclear. Fossil fuels will remain the main fuel [in the global energy mix] but we still see significant growth in natural gas, with global demand rising by 50 per cent from 2014 to 2040... 40 per cent of the energy growth will be met by natural gas. This will largely be driven by electricity generation, where in most parts of the world it will be the fuel of choice."

Interestingly, in Europe he noted that although there would be a decline in energy demand, gas demand would start increasing from now – even if it is unlikely to reach previous levels.

Yet one wonders if such optimism is a case of dressing-up a bad situation. In light of the current scenario, one colleague's response to what sometimes seemed like overly positive messages was understandable. As he put it: "This could all be a case of 'The Emperor's New Clothes'." Possibly. But looking at ongoing market developments it appears that the emperor at least has a new suit in the making.

Certainly, falling LNG prices, which will likely be driven down still further as the US ramps up LNG exports, could throw a lifeline to gas fired generators in Europe. More gas from the US would certainly increase competition with Russian gas. And as with anything, unforeseen developments can drastically change the future energy landscape. No one saw the financial crisis, the shale gas revolution or Fukushima coming – events that have had a huge impact on the power sector. Fewer even predicted that the cost of wind and solar would fall so rapidly.

The outlook for gas largely depends on policy. As Baecklemans noted: "An important element that will determine the choice of fuels, will be policies – more importantly, CO<sub>2</sub> climate-driven policies." But, to the frustration of many in the gas turbine industry, policies being implemented by the EU do not set any targets for gas fired plant in the generation mix going forward.

Instead, Tudor Constantinescu, Principal Advisor to Dominique Ristori (Director General for Energy), DG Energy, European Commission told delegates that the share of gas for

primary energy consumption would stay at around 25 per cent in 2030 and may fall slightly by 2050 but would "stay rather stable".

The only firm long-term targets set for any technology are at least 27 per cent by 2030 for renewables, and the same for energy efficiency. By 2050, the Commission expects renewables to account for at least 45 per cent of primary energy consumption.

Constantinescu made it quite clear that other fuel sources would essentially have to fit around renewables.

Unsurprisingly, Constantinescu's view was met with some consternation by what was a gas turbine audience. One delegate asked: "Why are you setting this target for renewables when you could just set a target for CO<sub>2</sub> emissions reduction? That would be much easier and then the best technology would win."

The Commission's focus is clearly on cutting emissions but with renewables and energy efficiency at the heart of that effort. Constantinescu said, however, that natural gas "is not antagonistic with the development of renewables." He noted that in time the gas transport infrastructure could be used as an energy buffer for renewable energy producers, where wind and solar energy is stored in the gas grid through power-to-gas conversion units.

Like many, the Commission sees the new energy system as much more flexible and much more adaptive. "It will be smarter in terms of: generation; demand; electricity, gas and heat networks; and energy storage."

Already power plant suppliers are building flexible cycle gas turbine plants (CCGTs) with fast start-up and ramp-up times. Such plants, along with gas peaking units, will support the integration of renewables. In the UK, Capacity Market auctions are already creating a more attractive proposition for investment in this type of gas fired generation.

Speaking at the Energy Institute's Security of Supply debate ahead of the UK's upcoming 3rd Capacity Market auction, Daniel Monzani, Head of Security, Department for Business, Energy and Industrial Strategy said: "We would expect gas to be competitive... It is likely we will probably see new investment coming through in flexible capacity in the next auction."

As other countries across the EU adopt similar mechanisms, this will help secure a future for Europe's gas-fired plant. Further, at the global level, the IEA stresses that although demand slows, gas is the only fossil fuel that does not suffer a decline in its share of the energy mix.

The gas turbine industry should therefore take comfort in the predictions that at least gas fired generation seems to be here to stay, albeit in a new guise.

In the meantime, Europe's generators will continue to struggle to find ways of making money. At the Brussels ETN conference Pedro Lopez Esteban, Director of CCGT Operations, Uniper exclaimed: "We are like a ship in the storm but we can make it." He offered up a slide showing a ship buffeted by huge waves.

This was perhaps the most accurate depiction of the situation. Forget the Emperor's new clothes or self-fulfilling prophecies. It captured the current turmoil facing gas fired generation; but in a different time it could also have been Noah's Ark and the prophecy of a new beginning after the storm.



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