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Climate change "rulebook" will not bridge emissions gaps

Kurtyka says the deal is "a big step" towards achieving the ambitions set out in Paris

Despite agreeing most of the rules needed to implement the Paris accord, many argue that the real task of actually reducing carbon emissions still lies ahead. **Junior Isles**

The "rulebook" agreed at the UN's Conference of Parties (COP) 24 climate change summit, held in Katowice, Poland, has been hailed as "a big step" towards achieving the climate goals set under the 2015 Paris Agreement. Some argue, however, that the deal will do little to help slow global warming.

Last month negotiators from 196 countries and the European Union worked for two weeks on the Katowice Climate Package – a set of rules for implementing the Paris goal of limiting global temperature rise to below 2°C from pre-industrial levels.

On signing the Katowice agreement Michał Kurtyka, Poland's Secretary of State in the Ministry of Environment and COP24 President said: "We have been working on this package for three years… we have taken a big step towards achieving the ambitions set in the Paris Agreement."

The deal passed in mid-December includes a universal system for how governments will measure, report and verify their CO_2 emissions-cutting efforts, whereby all countries will adhere to the same rules that will take effect in 2024.

The rules also include a global "stocktake", wherein countries agree to submit data on emissions to the UN every two years starting in 2024, along with new climate targets every five years. This will measure whether emissions are on track to keep global warming within the limit.

The rules also eliminate an earlier distinction between developed and developing countries over their commitments. However, the biggest stumbling block as the meeting drew to a close was over carbon markets – a provision for a global scheme that would allow countries to trade emissions reductions. The article related to this issue was largely deleted from the final agreement due to opposition from Brazil, with the carbon market discussion delayed to next year.

As discussions were predominantly technical in focus, the key question of how countries will step up their targets on cutting emissions remained largely unaddressed. On current targets, the world is set for 3°C of warming from pre-industrial levels, which scientists say would be disastrous. Further, in October the Intergovernmental Panel on Climate Change (IPCC) issued a report advising to limit warming to no more than 1.5°C to avoid dire consequences.

Ola Elvestuen, Norway's Environment Minister noted that the hardest

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Coal demand to remain stable through 2023, despite headwinds

Global coal demand looks set to rise for the second year in a row in 2018 but is forecast to remain stable over the next five years, as declines in Europe and North America are offset by strong growth in India and Southeast Asia, according to the International Energy Agency's latest coal market report, 'Coal 2018'.

Air quality and climate policies, coal divestment campaigns, phase-out announcements, declining costs of renewables and abundant supplies of natural gas are all putting pressure on coal. As a result, coal's contribution to the global energy mix is forecast to decline slightly from 27 per cent in 2017 to 25 per cent by 2023. But coal demand grows across much of Asia due to its affordability and availability.

"The story of coal is a tale of two worlds with climate action policies and economic forces leading to closing coal power plants in some countries, while coal continues to play a part in securing access to affordable energy in others," said Keisuke Sadamori, Director of Energy Markets and Security at the IEA. "For many countries, particularly in South and Southeast Asia, it is looked upon to provide energy security and underpin economic development."

This is why the IEA sees technologies like Carbon Capture, Utilisation and Storage (CCUS) as essential tools to bridge current and future energy needs with global and national climate ambitions.

But even without the added price tag of CCUS, the economic case for coal continues to look increasingly less convincing. A report published by financial think-tank Carbon Tracker at the end of November said that two-fifths of the world's coal power stations, including in India, were already running at a loss.

Out of the 6685 coal power plants studied worldwide, Carbon Tracker finds that 42 per cent of global coal capacity is already unprofitable because of high fuel costs and by 2040 that could reach 72 per cent as existing carbon pricing and air pollution regulations drive up costs. According to the firm, it costs more to run 62 per cent of India's coal capacity than to build new renewable generation and by 2030 that will rise to 100 per cent.

Such trends are driving investment away from coal. In late December investors overseeing more than $11 trillion in assets, including Schroders, Legal & General Investment Management and two of the biggest US pension funds, called on power companies to commit to ending coal use by 2030 and spell out preparations for a global shift towards low-carbon fuels.

In a letter to the *Financial Times*, investors led by the Institutional Investors Group on Climate Change and members of the Climate Action 100+ organisation have urged European utilities to set timelines for eliminating coal fired power generation in the EU and industrialised nations.

The call came as European Union member states and the European Parliament agreed to reform the bloc's electricity market, including a call to end coal subsidies by 2025.

The political agreement, which still requires formal approval, was announced by Austria, which holds the EU's six-month rotating presidency. "Member states can, after strict examination by the European Commission, distribute state aid but only until 2025," it said in a statement, referring to existing coal fired power plants.

The subsidies, designed to compensate electricity producers who maintained higher capacity to meet peaks in demand, had stirred debate over the role of coal in the bloc.

Miguel Arias Cañete, the European Commissioner for Climate Action and Energy, said the deal puts the "EU in the lead in terms of rules to accelerate and facilitate the clean energy transition".

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part – reducing actual emissions – was still ahead. "Now we have a rule book and finally the Paris agreement is complete. We have the system but the work starts now."

Mohamed Adow, Christian Aid's International Climate Lead, said: "The majority of the rulebook for the Paris Agreement has been created, which is something to be thankful for. But the fact countries had to be dragged kicking and screaming to the finish line shows that some nations have not woken up to the urgent call of the IPCC report."

He also noted that greater ambition was still needed. "The Paris Agreement pledges only get us to a world of between 2.7 and 3.5°C of global heating, far below the Paris goal of 1.5°C. What made the Paris Agreement dynamic was the review and ratchet mechanism. Without revised national emission reduction plans by 2020 we're not going to close that gap. To bend the emissions curve, we now need all countries to deliver these revised plans at the special UN Secretary General summit in 2019. It's vital that they do so."

The key deadline is 2020, when countries must show they have met targets set a decade ago for cutting their emissions, and when they must affirm new, much tougher targets.

With the rules for implementing Paris now defined, the focus now has to be on the much more difficult task of actually reducing emissions. This year global carbon emissions hit record levels.

Commenting on the deal and the work still to be done, Theresa Ribera, Spanish Environment Minister said: "I think that on balance the outcome is fantastic." However, she added: "The hard work is climate action, and that is what we need to concentrate on."

Environmental groups criticised the deal for being unambitious. Greenpeace said that although COP24 led to an approved Paris Agreement rulebook, no clear, collective commitment to enhance climate action targets – Nationally Determined Contributions (NDCs) – was reached despite expectations that the meeting would deliver step-change.

Jennifer Morgan, Director of Greenpeace International commented: "A year of climate disasters and a dire warning from the world's top scientists should have led to so much more… Recognising the urgency of raised ambition and adopting a set of rules for climate action is not nearly enough when whole nations face extinction.

Morgan: "A year of climate disasters... should have led to so much more"

"Without immediate action, even the strongest rules will not get us anywhere. People expected action and that is what governments did not deliver. This is morally unacceptable and… they must now come to the UN Secretary General's summit in 2019 with higher climate action targets."

Global carbon emissions on the rise

- Carbon emissions will show 2.7 per cent rise in 2018
- Curbing emissions has not affected companies' revenues

Junior Isles

A new report published in Earth System Science Data alerts states that global carbon emissions are set to hit an all-time high in 2018.

The Global Carbon Budget report, produced by the Global Carbon Project (GCP) and UK-based University of East Anglia, states that in 2018 the projected rise of carbon emissions will be 2.7 per cent, this is much higher than the 1.6 per cent rise in 2017.

An international team of more than 70 authors from dozens of institutions around the world analysed observations and models to compile an accurate account and projection of global carbon sources and sinks for the calendar year 2017.

Although the deployment of renewable energy worldwide is accelerating with electricity generation growing at 15 per cent per year on average over the last decade, the report says this has not been enough to offset the growth in fossil energy because renewables are growing from a low base.

The report is seen as yet another wake-up call following the IPCC report in October warning of the dangers of a 1.5°C rise in global temperature.

Mohamed Adow, Christian Aid's International Climate Lead, said: "All the warm words spoken at the UN climate summit in Poland won't help prevent climate change… With droughts, heat waves, floods and storms causing mayhem across the world in 2018 the fact emissions are actually increasing this year shows the greater urgency that governments need to show."

International Energy Agency data also showed the world's advanced economies will see an uptick in their carbon dioxide emissions in 2018, bucking a five-year long decline.

According to the latest available energy data, energy-related CO_2 emissions in North America, the European Union and other advanced economies in Asia Pacific grew. As a result, the IEA expects CO_2 emissions in these economies to increase by around 0.5 per cent in 2018.

The IEA also expects emerging economies to emit more CO_2 than in 2017. The IEA's full global energy and CO_2 data for 2018 will be released in March, but all indications point to emissions growth globally, driven by rising energy use and a global economy expanding by 3.7 per cent.

The news came as a group of companies proposed the introduction of a European or regional carbon price floor in the power sector and minimum carbon pricing for transport and buildings. The minimum carbon price is seen as a complement to the EU Emissions Trading System (EU ETS), Europe's main tool for reducing carbon emissions.

Some have argued that carbon taxes and trading schemes hurt economic competitiveness. The OECD, however, argues against this assumption. According to a new OECD report, emissions curbs set by the EU ETS have not hurt revenue, profits or employment at firms subject to the cap-and-trade programme over 2005-2014 period.

The Joint Impact of the EU ETS on Carbon Emissions and Economic Performance compares financial data from around 2000 firms operating ETS-regulated facilities across the EU with data from similar-sized unregulated firms from the same countries and sectors. It finds that ETS regulations had no negative effect on revenue, profits, fixed assets or jobs, and, in fact, firms subject to the ETS tended to perform better.

Spain's energy strategy aligns with EU carbon neutral plan

Spain is proposing a renewable energy plan aimed at producing 100 per cent of the country's electricity from renewables by 2050. The plan, which is set to be adopted by the cabinet, also aims to cut emissions by more than 90 per cent over the same period.

Speaking at the UN's COP24 climate change conference in Katowice, Poland, Teresa Ribera, Minister for the Ecological Transition, said climate change already poses a direct physical threat to Spain and stressed that the new government, which came into power in June, aims to decarbonise the economy.

The new plan, called the Climate Change and Energy Transition Law, sets targets for how to wean the country off fossil fuels, while providing financial support and training to people whose jobs could be threatened by the change.

Under the proposal, no more new licences for oil and gas exploration in Spanish waters will be issued and the country will stop all drilling completely by 2040.

To shift the electricity system away from fossil fuels, the government plans to start competitive tenders for 3000 MW of renewable power a year. It says that developing more energy storage will also be essential.

"Fighting climate change is a global task that has to be tackled urgently," said José Ignacio Galán, Chairman and Chief Executive of Iberdrola. "The EU has been leading this effort for decades. Now Spain is playing its part."

In late November, the European Commission announced a new long-term strategy for the EU to be carbon-neutral by 2050.

The European Union has said there needs to be a debate among member states about how to achieve the goal. To align with the Paris agreement, the EU will submit the ambitious strategy to the United Nations by early 2020.

A study issued at COP24 presented the feasibility of a European energy transition to 100 per cent renewable sources. The new scientific study shows that the transition to 100 per cent renewable energy will be economically competitive with today's conventional fossil fuel and nuclear energy system, and lead greenhouse gas emissions to zero before 2050.

Undertaken by Finland's LUT University and Energy Watch Group, the first-of-its-kind scientific modelling study has simulated a full energy transition in Europe across the power, heat, transport, and desalination sectors by 2050. The study's publication came after approximately four and a half years of data collection, and technical and financial modelling under the research and analysis of 14 scientists.

- Spain's Acciona Energia has begun a project to implement the traceability of the renewable nature of its electricity generation worldwide through blockchain technology, meaning that its clients who require it can check – in real-time and from any location in the world – that 100 per cent of the electricity supplied is clean.

Developing countries take top spot in clean energy

Developing nations are seizing the mantle of global clean energy leadership from wealthier countries, according to a comprehensive new study from BloombergNEF (BNEF).

Between them, emerging market nations surveyed by BNEF's annual Climatescope project accounted for the majority of new clean energy capacity added and new funds deployed, globally in 2017.

According to BNEF, developing nations added 114 GW of zero-carbon generating capacity of all types, with 94 GW of wind and solar generating capacity alone – both all-time records. Concurrently, they brought on line the least new coal fired power generating capacity since at least 2006. New coal build in 2017 fell 38 per cent year-on-year to 48 GW. That represents half of what was added in 2015 when the market peaked at 97 GW of coal plant commissioned.

In terms of investment, developing nations have emerged as a hot destination, not only for development banks, export credit agencies and other backers but also for private sector players.

In December at the COP24 climate summit in Poland, the UK announced that it has invested £100 million ($127 million) in renewable energy projects across Africa. The investment will ensure that hundreds of thousands of people will get electricity for the first time. It will support up to 40 more renewable energy projects over the next five years.

Commenting on the Climatescope report, Dario Traum, BNEF senior associate and Climatescope project manager, said: "It's been quite a turnaround. Just a few years ago, some argued that less developed nations could not, or even should not, expand power generation with zero-carbon sources because these were too expensive. Thanks to the ongoing trends, however, the price of renewables power is now often lower than electricity from fossil fuel plants, with developers in 2017 committing to supply wind power for just $17.7 (€15.67) per MWh and solar power for as low as $18.9 per MWh.

- The World Bank has announced an investment of $200 billion to fund the fight against climate change. The funding is for a new set of climate targets for 2021-25.

The new plan significantly boosts support for adaptation and resilience, recognising mounting climate change impacts on lives and livelihoods, especially in the world's poorest countries. The World Bank says that the funding will support the generation, integration and enabling infrastructure for 36 GW of renewable energy and deliver substantial energy savings through efficiency improvement.

Developers show belief in US offshore wind sector

■ BOEM awards three lease areas ■ Offshore wind roadmap launched

Siân Crampsie

Interest in the USA's emerging offshore wind energy sector is surging, according to the country's wind energy association.

The latest auction for offshore wind energy lease sites attracted 11 companies, including global leaders in offshore wind, and resulted in contracts awarded to three consortia for a total of 157 800 hectares off the coast of Massachusetts that could be developed into over 4 GW of capacity.

The auction was "highly competitive", according to the American Wind Energy Association (AWEA) and went through 32 rounds of sealed bidding. The winners, announced by the Bureau of Ocean Energy Management, are Equinor Wind, Mayflower Wind Energy, and Vineyard Wind.

The sucessful bidders will pay around $135 million each for the privilege of holding 33-year development rights in federal waters south of Cape Cod. The auction, held by the US Bureau of Ocean Energy Management (BOEM), reflects "surging interest" in the USA's offshore wind power sector, AWEA said.

Winning bids for all three of the Massachusetts lease areas far exceed the previous record bid for a single lease area, set by a $42.5 million bid from Equinor (then Statoil) in a 2016 New York lease auction.

"The intense competition we've seen in this offshore wind lease auction is completely unprecedented. With strong support from Secretary Zinke, Massachusetts and other states, global businesses now recognise the potential of America's world-class offshore wind resources," said Nancy Sopko, Director, Offshore Wind, for the American Wind Energy Association.

Earlier this year, Massachusetts doubled its offshore wind goal to 3.2 GW by 2035 – one of the most ambitious offshore wind policies in the nation. The three areas awarded in the latest auction are on the Outer Continental Shelf of the Atlantic Ocean.

Mayflower is a partnership between Shell and EDP Renewables. Vineyard Wind, based in New Bedford, is a partnership between Copenhagen Infrastructure Partners and Avangrid Renewables.

In a statement, Equinor said: "Equinor firmly believes in the long-term regional potential for offshore wind as a major local source of renewable, reliable and cost-effective energy."

To date, the BOEM has awarded 16 commercial offshore wind leases off every eastern seaboard state from Massachusetts to North Carolina. In November, the US National Offshore Wind Research and Development Consortium launched its first roadmap for US offshore wind energy development.

The roadmap establishes a long-term vision for offshore wind development in the US and identifies key priorities for creating a national leading clean energy sector.

Argentine recession hits infrastructure projects

Argentina's economic recession is putting energy investments at risk, its government has warned.

Local media in the country has reported that infrastructure projects have been put on hold by the government because its risk index – as measured by investment bank JP Morgan – is at 782, almost a record high for the current administration.

The high risk index makes credit more expensive. The recession has also impacted the value of the peso.

According to local press, the planned $1 billion Portezuelo del Viento hydropower project will no longer be developed under Argentina's PPP scheme, but under a traditional public works model.

A tender process for development of the 210 MW power plant to be located in Mendoza province was due to be launched in December.

Last month the Inter-American Development Bank (IDB) approved two financing packages worth a total of $80 million to support a project to upgrade the Argentine-Uruguayan binational hydroelectric power plant in Salto Grande.

The project will help to improve the availability and reliability of the power plant and includes work to modernise the turbine speed regulators, replace the hydro-mechanical systems of the spillway, strengthen the spillway gates, upgrade auxiliary electrical systems and control systems, and replace the main transformers.

Elsewhere, Argentina's Jujuy government has signed a letter of intent with the French Development Agency (AFD) and the European Investment Bank (EIB) for the finance of 95 MW of distributed solar projects.

The financing will be used to develop a total of 13 photovoltaic (PV) projects in a variety of locations.

■ Russia and Argentina have signed a strategic deal on cooperation in nuclear energy. The agreement will enable the two countries to broaden their existing cooperation and could help pave the way for the construction of new nuclear energy capacity in Argentina.

Dominion saves Scana Corp

Regulatory approval of a deal to save the troubled US utility Scana Corp will help the firm to draw a line under the financial problems triggered by the bankruptcy of nuclear company Westinghouse.

South Carolina's Public Service Commission has given the go-ahead for Virginia-based Dominion Energy to buy Scana – the parent company of South Carolina Electric & Gas – in a cash and stock deal value

d at $7.9 billion.

The deal is the largest acquisition in Dominion's history and its approval by South Carolina's regulatory authorities last month paved the way for the two companies to close the transaction by the end of 2018.

The combined company would deliver energy to around 6.5 million regulated customer accounts and operate a generating portfolio of some 33 GW, Dominion said. It would also operate a natural gas pipeline of 106 400 miles, and electric transmission lines of 93 600 miles.

The acquisition deal was triggered after Scana announced it would abandon the construction of the V. C. Summer nuclear project, where Westinghouse was the main contractor.

EPA planning to lift restrictions on emissions

■ Roll-back for Obama-era rules
■ CO_2 emission limits raised

Emissions restrictions for new coal fired power plants in the USA could be eased under a new proposal from the US Environmental Protection Agency (EPA).

The EPA has put forward plans to revise the New Source Performance Standards (NSPS) for greenhouse gas emissions from new, modified, and reconstructed fossil fuel power plants, removing a determination that they must be equipped with carbon capture and storage (CCS) technology.

"Consistent with President Trump's executive order promoting energy independence, EPA's proposal would rescind excessive burdens on America's energy providers and level the playing field so that new energy technologies can be a part of America's future," said EPA Acting Administrator Andrew Wheeler.

"By replacing onerous regulations with high, yet achievable, standards, we can continue America's historic energy production, keep energy prices affordable, and encourage new investments in cutting-edge technology that can then be exported around the world."

The existing rules for new and reconstructed coal plants were finalised by the EPA in 2015 under the Obama administration, and were part of plans by the then-President to tackle carbon emissions. It limited emissions to 1400 pounds of CO_2/MWh, and essentially prevented the construction of new coal fired capacity in the USA.

If the EPA's proposal is approved, the new carbon emissions limit would be raised from 1400 lbs (636 kg) of CO_2/MWh to 1900 lbs (864 kg) /MWh.

"Today's actions reflect our approach of defining new, clean coal standards by data and the latest technological information, not wishful thinking," said EPA Assistant Administrator for the Office of Air and Radiation Bill Wehrum. "We take seriously our responsibility to protect public health and the environment in a manner consistent with the requirements of the Clean Air Act and will continue to do so. US coal fired power will be a part of our energy future and our revised standards will ensure that the emissions profiles of new plants continue to improve."

■ Entergy has announced plans to close 3.6 GW of coal fired capacity as part of a settlement with environmental groups that sued the utility in federal court for alleged violations of the Clean Air Act (CAA). Entergy will close two coal fired plants that do not possess modern scrubbing technology such as low-nitrogen oxide burners to reduce emissions. It would otherwise have to spend an estimated $2 billion to install advanced scrubbers to comply with the latest emissions rules.

Bolivia shores up grid

Bolivia is planning to boost the capacity of its electricity transmission grid ahead of planned increased electricity trading with neighbouring Argentina and Brazil.

The country has launched a tender for the design and construction of a 500/230 kV substation to be located in Las Brechas.

The work is part of Ende Transmisión's $133 million, 176 km Carrasco-La Brechas transmission line project.

Ende said recently that construction of the 70 km Argentine stretch of the 110 km, 170 MW capacity interconnection with Bolivia, where the section is complete, is pending environmental approval.

Indonesia remains on coal path

Despite several initiatives encouraging renewable energy, Indonesia's push for electrification is poised to accelerate the growth of domestic coal consumption. **Syed Ali**

Despite Indonesia's push for more renewables and cleaner energy, Wood Mackenzie expects coal to still dominate the fuel mix at more than 60 per cent from now until 2027. This is due to better coal economics and relatively unsupportive renewable energy policies, says the research firm.

According to a research note, the country's electrification programme will be the largest factor driving the increase in domestic coal use, causing coal consumption for power generation to grow at an 8.3 per cent CAGR between now and 2027.

Indonesia has been attempting to accelerate electrification to meet the demands of its growing population and rapid industrialisation. Under the RUPTL, 58 greenfield coal fired power plants are due to come online in the period to 2027, causing coal fired capacity to more than double from 24 418 MW in 2018 to 51 800 MW in 2027.

Research Analyst Vicky Adijanto said: "We estimate Indonesia's domestic coal consumption for power generation to double from 2018 to 2027, increasing its share compared to the total consumption from 18.5 per cent to 33.6 per cent."

Wood Mackenzie also noted, however, that recent electricity demand growth has been below expectations. In 2017 state electricity company Perusahaan Listrik Negara (PLN) achieved sales growth of only 3.1 per cent compared with its target of 8.3 per cent. This prompted the government to lower its capacity forecast over the next 10 years by 22 GW in the RUPTL.

As a result, some major power projects have been cancelled or delayed. The latest RUPTL shows that potential coal capacity has been reduced by 5 GW. However, coal's cost competitiveness means that most of the delayed projects are gas powered plants. Gas capacity has been reduced by 10 GW, while renewables capacity has been reduced by 6.7 GW.

Indonesia passed its Ministerial Decree No 1953 K/06/MEM/2018 in July 2018 to promote renewables. But despite the push, the policy is setting a higher barrier to entry for renewable energy to gain traction in the market.

For example, the decree requires 50 per cent of the hired engineers in this relatively new industry to be locals. Indonesia also provides limited incentives, such as tax allowances and holidays, for renewable generation.

Most importantly, the amount of cost of generation provision – a price cap for any kind of electricity tariffs to be paid by the government in different regional grids, colloquially known as BPP – is restricting investment in renewable energy.

■ Construction of the Jawa-1 combined cycle gas fired power plant, one of the biggest projects of its kind in Southeast Asia, kicked off in December. The 1760 MW project is being built by two different consortiums – PT Jawa Satu Power (JSP) and PT Jawa Satu Regas (JSR).

NZ eyes world's largest virtual power plant

SolarCity Corporation, a subsidiary of Tesla, Inc., is creating what it says will be the world's largest virtual power plant (VPP) through the connection of more than 3000 existing home solar and battery systems to the national grid.

The project will create a generation and storage network that will help provide energy to the power grid when it is unable to cope with demand or there is a fault.

"Australia says it plans to build the world's largest virtual power station but we're actually doing it with our existing systems and we're adding more everyday," said SolarCity founder and CEO Andrew Booth.

The VPP will make energy available to Transpower's Demand Response Programme and participating customers will be paid. SolarCity's existing solar customers already generate 13.6 GWh of energy annually. With Panasonic batteries those systems will collectively store 18 MWh of power and prevent 2230 tonnes of CO_2 from entering the atmosphere every year.

New Zealand's electricity demand is forecast to double by 2050.

Japan turns to tender-based system for new offshore wind

The two houses of the National Diet (Parliament) of Japan have passed a bill meant to promote the use of the country's territorial waters for the development offshore renewable power generation facilities, which will be enforced next spring.

According to the new offshore wind law, the Japanese government will identify approximately five offshore wind development areas and will launch the country's first offshore wind tenders this spring or summer. Successful bidders will be given the right to use the zones for a 30-year period.

This represents a major change for the Japanese wind industry, which used to rely on feed-in-tariffs (FiTs) for the development of offshore projects. The Ministry of Economy, Trade and Industry (METI) introduced a specific FiT for offshore wind in 2014. The development of a tender-based system sends a strong signal that the Japanese government is committed to long-term investment in the sector.

At the same time Tokyo Electric Power Company Holdings Inc. (Tepco) said it planned to commission a 2.4 MW pilot offshore wind farm in Japanese waters on January 1, 2019 and subsequently add up to 3 GW.

The single-turbine project is Tepco's first commercial offshore wind farm. The turbine, mounted on a bottom-fixed foundation, is located off the coast of Choshi in Chiba prefecture. Testing has been ongoing since 2013.

Renewables support falters as Taiwan abandons nuclear shutdowns

Taiwan has reversed its plan to shutdown its nuclear power plants, and at the same time cut support for its nascent renewable energy market.

Last month it indefinitely postponed the decommissioning of Jinshan nuclear power plant's first reactor after 40 years of operation due to nuclear waste management issues.

The news followed the announcement that the country had abandoned plans to be nuclear-free by 2025 in response to the results of a referendum held on November 24th.

The intention of the government was to eliminate the use of nuclear energy by 2025 by increasing renewable energy to 20 per cent and natural gas to 50 per cent, and reduce energy from coal to 30 per cent.

Its plan for increasing renewables, however, appears to be set for a step back with the news of proposals for a reduction in feed-in-tariff (FiT) for offshore wind.

In December Taiwan's Ministry of Economic Affairs proposed a 12.71 per cent reduction in FiTs for offshore wind projects that sign Power Purchase Agreements (PPAs) in 2019 as compared to the 2018 rate. The new FiTs are expected to be issued by February 2019.

Ørsted said such a reduction could potentially have a negative impact on its localisation plans and the final investment decision for the company's first offshore projects in the country.

"We are on track when it comes to the milestones we need to enter the PPA in 2018," an Ørsted spokesperson said in December.

"However, if we for any reason slipped into 2019 – and if the drafted 12.7 per cent cut in FiT for offshore wind in 2019 became indeed reality – then it would have a negative impact on Ørsted's localisation plans and also on our final investment decision for the first Taiwanese offshore projects, planned for March next year [2019]."

Ørsted President for Asia-Pacific Matthias Bausenwein said that the company might reconsider its plan to invest in offshore wind farms on the granted locations if the new tariff pushes through and the firm does not sign a PPA this year.

Developers that secured rights to build offshore wind farms in Taiwan have to sign their PPAs with Taipower by the end of 2019.

Danish fund Copenhagen Infrastructure Changfang II K/S also expressed concern over the new tariff. On November 30th, it received approval to invest NT$523.5 million ($16.97 million) to facilitate offshore wind turbine installations at Copenhagen Infrastructure Partners' (CIP) unit in Changhua County. It said it would now reassess its planned investment.

Taiwan Investment Commission spokesperson, Yang Shu-ling, noted: "The approval will be cancelled if CIP does not execute the investment plan within next 12 months."

The ministry also proposed trimming FiTs for solar and other forms of green energy.

The preliminary tariff for ground mounted solar panel arrays would see the largest drop of 12.15 per cent to NT$3.9686 per unit next year, compared with roof-top solar panels and solar facilities on reservoirs or fishing farms.

MGen shifts focus to raising renewable energy capacity

The power generating arm of Manila Electric Co. (Meralco) will focus on developing its renewable energy (RE) capacity of 1500 MW in the next three to five years as it looks to disrupt its own legacy distribution business, its top official said.

Meralco Powergen Corp. (MGen) was mandated to actively pursue renewables, solar and wind technology, its President and Chief Executive Officer, Rogelio Singson, said.

"We will be developing our capability to do more renewables. We're looking at 1500 MW in three to five years," Singson said.

While MGen is looking at all technology options, the bulk of the 1500 MW will be solar while a few will be wind projects, Singson said.

France urged to be more ambitious on offshore wind

■ Multi-year wind plans disappoint ■ Siemens, Shell, and TenneT propose wind-to-H_2

Siân Crampsie

Recent renewable energy goals outlined by the French government have disappointed the offshore wind energy industry.

The government recently set out plans to increase onshore wind capacity from the current 14.3 GW to some 35 GW by 2030 and to add a further 2.2 GW of offshore wind, on top of the 3 GW already tendered and waiting to be built.

France Energie Eolienne (FEE), the country's wind energy association, said that the targets for offshore wind energy were disappointing and should be raised so that the country could take advantage of growing opportunities in the global offshore sector, including job creation and security of supply.

It added that France had all the assets in hand to be a European engine of offshore wind and a leader in floating wind.

European wind energy association, WindEurope, said that the offshore wind numbers were disappointing, adding that France has massive potential both in fixed-bottom and floating offshore wind.

"They could comfortably develop up to 11 GW by 2030. 2.2 GW is really unambitious and will leave France at the bottom of the class on offshore wind, missing out on jobs and investment. Let's hope their National Energy and Climate Plan for the EU has a better number," said WindEurope CEO Giles Dickson.

The French programme outlines four offshore wind tenders by 2022, including the 500 MW already tendered at Dunkirk. It has not been specified whether the remaining three tenders will be for fixed-foundation or floating offshore wind.

Companies active in the floating offshore wind sector said they were disappointed by the targets. Six companies, including Eolfi, Naval Energies and Ideol, had earlier called on the government to be more ambitious and to add specific tenders for floating offshore wind into its programme.

They said that an initial volume of up to 750 MW should be awarded in 2019 in order to start the cost-lowering procedure expected to lead to €60 per MWh by 2030. Overall the companies have called for a 5 GW target by 2023.

They added that failure to implement a 2019 tender would stall momentum in the industry, leading to uncertainty for all market participants and a missed opportunity for France to take a lead in the floating offshore wind sector.

France received its first offshore wind power from the Floatgen floating wind turbine in September. So far, the country approved four floating wind pilot projects with a combined capacity of just below 100 MW. Three are located in the Mediterranean, with the commissioning expected throughout 2020 and 2021.

France is aiming to close its coal fired capacity by 2022, and will also reduce the amount of nuclear energy in the generating mix to 50 per cent by 2035. France currently relies on nuclear power for nearly 72 per cent of its electricity needs.

Germany has been touted by some as an example of how France could use wind to help replace capacity that will disappear when the country closes it nuclear plants.

In late November, the lower house of Germany's parliament, the Bundestag, approved a set of legislative measures that include auctions for 4 GW of onshore wind and 4 GW of solar power between 2019 and 2021. The move will support Germany's climate goals.

The decision was shortly followed by the news that Siemens, Shell, and TenneT have proposed a new tendering model for offshore wind power in Germany, which would be used to produce hydrogen. A new study conducted by E-Bridge suggests that the new tendering model would make way for an additional 900 MW of offshore wind capacity, coupled with hydrogen production, to be built between 2026 and 2030. The electricity generated at sea would be transported ashore by the offshore grid and used to generate hydrogen. The green hydrogen would be transported via the gas network. It could then be used in other sectors, such as industry or the mobility sector.

■ Germany has postponed until February a decision on how fast it should phase-out brown coal fired power plants and whether the government should compensate utilities as well as regions that could face job losses.

PGE seeks offshore wind partners

■ 50 per cent stakes in project companies on offer
■ World Bank calls for ambitious renewables targets

Polish state-owned energy company Polska Grupa Energetyczna (PGE Group) is looking for an experienced partner to help it implement 2.5 GW of offshore wind energy capacity in the Baltic Sea.

The company said last month that it had invited over a dozen parties to participate in the projects by purchasing stakes of up to 50 per cent in two project companies – Elektrownia Wiatrowa Baltica-2 and Elektrownia Wiatrowa Baltica-3 – that own the concessions for building offshore capacity located 25-30 km from the coastal city of Leba.

The Polish power producer is currently working on securing environmental permits for the two projects and anticipates a positive decision on environmental conditions next year.

"Wind measurements in the Baltic Sea in the area of the planned investment are ongoing since January 2018. So far, the results confirm very good wind conditions for the surveyed areas. Estimated wind speeds at our locations might exceed 9 m/s," commented Henryk Baranowski, CEO of PGE.

The ultimate goal is to generate first power around 2025 and achieve commercial operation in 2026.

Elektrownia Wiatrowa Baltica-2's concession area could generate up to 2.5 GW, while Elektrownia Wiatrowa Baltica-3's area is for 1 GW.

Poland has set a target of generating 14 per cent of its electricity with renewables by 2030.

In a recent report, the World Bank called for the country to set a more ambitious target of 50 per cent share of renewable energy in power generation by 2030 in order to reduce air pollution.

"Poland has already achieved success in decoupling economic growth from emissions. It has simultaneously increased its gross domestic product seven times and decreased its emissions in the electricity and heating sector by 30 percent since 1989," said Carlos Pinerua, World Bank Country Manager for Poland and the Baltic States.

Pinerua added: "Poland's heavy reliance on coal creates serious environmental problems and imposes heavy health costs on the population, who breathe polluted air… investing in renewables now would be good for people's health, as well as economically justified."

New setback for Finnish nuclear

Finland's nuclear sector has suffered another setback with news that the Hanhikivi 1 power plant will start operations in 2028, four years later than the most recent expectations.

Finnish operator Fennovoima and Russian state nuclear utility Rosatom had promised that the project would run on time because it is using proven technology. The new start date is eight years later than the start date that was originally proposed when Finland's parliament approved the project in 2010.

Rosatom has struggled to meet the strict demands of STUK, the Finnish nuclear regulator renowned as one of the most demanding in the world, leading to delays in the 1200 MW VVER-design project.

Fennovoima says it is now expecting to receive the construction licence for Hanhikivi 1 in 2021. It is still in the process of supplying the regulator with the design documentation of the plant for assessment.

Fennovoima announced on December 21st that it had received a new schedule estimation from Rosatom. "Finnish safety regulations are the strictest in the world and because of that, the design has taken longer than expected," Fennovoima CEO Toni Hemminki was quoted as saying by local media.

The Hanhikivi 1 power plant project has caused controversy in Finland because Rosatom is not just a supplier but also the main shareholder and financial backer of Fennovoima. The Finnish government had to pursuade Fortum to take part in the consortium in 2015 to ensure there were enough EU shareholders.

UK removes export tariff for rooftop solar

The UK's decision to remove the export tariff for new solar panels installed on homes will damage the growth in the country's solar energy sector, the industry has warned.

The government says it will remove the export tariff – which pays householders for exporting excess energy generated by solar panels to the grid – for new installations from April 1, 2019.

There is a one-year grace period for installations over 50 kW in size. However, the Renewable Energy Association (REA) says that the decision will "create a real hiatus" in investment in decentralised renewable energy. It added that the government would have to work quickly "to consult on, establish and implement a successor scheme to avoid significantly stalling the much needed deployment of decentralised renewables".

In December, UK regulator Ofgem confirmed that households with rooftop solar would be able to continue to receive payments for exporting energy to the grid even after installing battery storage.

There had previously been conflicting guidance on the issue, according to the Solar Trade Association (STA).

"Government has been telling the industry that they want to see battery storage market take off in the UK, but the confusion around installing battery storage with existing FIT-accredited solar has been a key barrier," said Nick Wood, Powervault and Chair of the STA's Residential Energy Storage Working Group. "It's very good news that Ofgem has listened and that it has made the right decision to help unlock the retrofit market. This now means that the domestic battery storage industry in the UK can install batteries and smart meters in existing solar homes with confidence that deemed export payments, which are valued by solar home owners, are safe."

■ The STA says that the cost of large-scale solar energy in the UK could drop below £40/MWh by 2030, and is likely to achieve £50-60/MWh in 2019. "Although costs vary significantly on a site by site basis, the findings confirm that under a long-term power purchase contract, solar could soon be the cheapest electricity generation technology in the UK," STA said in a statement.

Tanzania signs $3 billion hydro deal

Egyptian contractors are set to start building a controversial large-scale hydropower plant in Tanzania's Selous Game Reserve. **Siân Crampsie**

Tanzania is gearing up to start contruction of a 2115 MW hydropower plant after signing a contract with two Egyptian companies.

Under the $3 billion deal, Arab Contractor and El Sewedy will build the Stiegler's Gorge hydropower plant in the Selous Game Reserve, in Tanzania's Coast and Morogoro regions.

The project is controversial but is a key part of Tanzania's master power plan and will also help to interconnect the grids of Tanzania, Kenya, Uganda and Zambia.

Representatives of state-run Tanzania Electric Supply Co, El Sewedy and Arab Contractor signed the agreement in the presence of President John Magufuli and Egyptian Prime Minister Mostafa Madbouly in December. Arab Contractors will have a 55 per cent stake in the project and El Sewedy 45 per cent.

The Selous Game Reserve is the largest in Africa and is also a United Nations World Heritage site. Construction of the facility will involve building a main dam and other structures, with an expected reservoir length of 100 km, covering an area of about 1350 km^2. The dam height is about 134 m.

The World Wildlife Fund conservation group said in a report published in July 2017 that the proposed hydropower dam "puts protected areas of global importance, as well as the livelihoods of over 200 000 people who depend upon the environment, at risk".

"The impact on Tanzania's largest river would affect many ecosystem services it provides. It would affect tourism in Selous downstream in some of the most abundant wildlife areas in the game reserve," it said.

Japan reconsiders Turkish nuclear project

Japan is considering the withdrawal of support for a new nuclear power plant on Turkey's Black Sea coast due to rising costs.

According to Japan's *Nikkei* newspaper, the public-private consortium tasked with building the 4600 MWe Sinop nuclear power plant is in negotiations to withdraw from the contract it signed in 2013.

The delayed projects construction costs have ballooned to around 5 trillion yen ($44 billion), nearly double the original estimate, making it difficult for lead builder Mitsubishi Heavy Industries and its partners to continue with the plans, *Nikkei* reported.

The increase was due to heightened safety requirements in the wake of the 2011 meltdown at Japan's Fukushima Daiichi nuclear power plant. The recent fall in the Turkish Lira has also contributed to the cost increases, it added.

MHI and its partners have been conducting a feasibility study on the proposed four-unit nuclear plant. Operation of the first reactor had been due to start in 2023.

The news is a blow to Tokyo's plans to promote exports of Japanese nuclear technology to emerging economies as part of the country's growth strategy. Japanese Prime Minister Shinzo Abe is reported to have discussed the project with Turkish President Recep Tayyip Erdogan on the sidelines of the December G20 meeting in Argentina in December 2018.

Earlier in 2018 Itochu Corp left the consortium due to the rising safety-related costs.

Meanwhile, construction of Turkey's first nuclear power plant at Akkuyu started in April 2018.

Akkuyu will comprise four 1200 MWe Russian VVER units. In December, Rosatom said that the Turkish Atomic Energy Authority (TAEK) had granted a limited works permit, enabling limited construction work on the second unit at Akkuyu to start.

Rosatom will have to obtain a construction licence from TAEK in order to allow concrete pouring to start at unit 2.

Tunisia picks solar bidders

Plans to build solar and wind energy capacity in Tunisia are taking shape with the selection of prequalified companies for 800 MW of capacity.

The country's Ministry of Industry and Small and Medium Enterprises has prequalified 16 companies and consortia for a 500 MW solar tender and 12 parties for a 300 MW wind auction.

Among the prequalified companies are Masdar, EDF, Acciona, Canadian Solar, Enel, Engie, and ACWA Power.

The solar tender will be split into five projects ranging in size from 50 MW to 200 MW. In the wind tender, the ministry is looking for developers of 200 MW of wind power capacity at Jbel Abderrahmane in Nabeul governorate and a further 100 MW at Jbel Tbaga in the governorate of Kebili.

UAE restructures utility sector

The government of the United Arab Emirates (UAE) is bringing the country's water production and power generation efforts under one umbrella in an effort to boost efficiency and open new avenues of cooperation and integration between national establishments throughout the sector.

The government has launched the Emirates Water and Electricity Company (EWEC), which will bring together the water production and power generation efforts in Abu Dhabi and the emirates that are currently served by the Federal Electricity and Water Authority (FEWA).

The new company, which would be based in Abu Dhabi, will replace the Abu Dhabi Water and Electricity Company (ADWEC) and will be under the umbrella of the Abu Dhabi Power Corporation.

EWEC will cover the water and power needs of the majority of the UAE and will be responsible for distributing more than 80 TWh of electricity and 1.2 billion cubic metres of water in the country annually, the government said. The new company will also oversee the progress and completion of power and water projects that are currently under way.

Work is currently under way to finalise bilateral integration agreements between EWEC and FEWA, and the two entities will work towards unifying water production and power generation.

■ ACWA Power has announced a partnership with the Industrial and Commercial Bank of China Limited (ICBC), Shanghai Electric Group Co. Ltd (SEGC), and Spanish company Abengoa, for the 950 MW Noor Energy 1 Plant in Dubai.

Oman boosts share of renewables

■ PDO and AER initiatives drive growth

■ AER launches Sahim-2 solar programme

The share of renewable energy in total generation capacity in Oman is likely to rise to 20 per cent by 2030 thanks to continued investment in solar, wind, and other resources.

According to the Oman Power and Water Procurement Company (OPWP) – the sole buyer of all electricity and water output in the sultanate – initiatives backed by entities such as the Authority for Electricity Regulation Oman (AER) and Petroleum Development Oman (PDO) are boosting renewable energy capacity.

"By 2024, we will be achieving a contribution of around 12 per cent from OPWP-driven renewable projects. Another 2-5 per cent contribution will come from other development channels like Sahim and PDO ventures," said Naif al Abri, Project Development Director at OPWP, speaking at the Oman Sustainability Energy and Technology Summit in Muscat last month. "Thus, our hope is to reach a 20 per cent share from renewables by 2030."

PDO in December said that it was examining the possibility of setting up a 30-40 MW wind farm project. The firm is currently in the advanced stages of a feasibility study on the project and is gathering data. It hopes to be able to launch a request for proposal on the project in 12-16 months' time.

Also in December, AER announced that a tender for the installation of rooftop solar systems on an initial batch of 3000 residential buildings in Oman will be floated in the first half of 2019.

The project represents the second phase of the National Solar Energy Initiative, dubbed 'Sahim', which seeks to promote the use of clean energy resources in support of Oman's energy diversification goals.

Sahim-2 aims to drive the wide-scale deployment of small PV systems (3 kWp-5 kWp) on the rooftops of between 10-30 per cent of residential premises in Oman, according to Eng Hilal al Ghaithi, Director of Customer Affairs and Sahim Project Director at AER. He said: "Unlike Sahim-1, the costs of procuring, installing, operating and maintaining Sahim-2 residential PV systems will not be paid for by customers but will be met by private sector entities who will recover related costs through contracts with licensed suppliers."

AER is currently working with consultants to develop a legal and operational framework that sets out the principles and guidelines necessary for planning, implementing and developing technical and financial models for Sahim-2, as well as the roles and responsibilities of all the participating entities.

OPWP has around 2650 MW of solar, wind, and waste-to-energy based capacity planned for procurement by 2024.

Of this target, around 2000 MW of capacity will be procured in the form of solar-based Independent Power Projects starting with Ibri Solar II, which comprises a 500 MW solar PV project currently under procurement.

Bids for Ibri Solar II are being evaluated, with construction likely to be initiated in the first half of 2019.

OPWP's renewables development plan also envisions around 600 MW of wind-based capacity.

Renewables dominate in utilities' futures

■ Enel, Endesa, Ørsted set out strategic plans ■ Political risk higher for utilities

Siân Crampsie

European utilities are continuing to make investment in renewable energy the central pillar of their strategic plans in spite of uncertainty about the trading environment.

Ørsted says it will invest DKK200 billion ($30.25 billion) in green energy by 2025 as part of its strategy to contribute to the transformation of the global energy system and maintain its position as a global leader in offshore wind energy.

Its announcement followed news from Enel, which said that it would boost its renewable energy generating portfolio by 23 per cent by 2021, to over 48 GW. It will spend €10.6 billion on renewable energy asset development over the next three years, while its installed capacity of thermal power plants will drop to 39.5 GW in 2021, from 46.5 GW in 2018.

Spanish group Endesa is also planning to cut thermal generation by shutting down two coal fired power plants that account for 40 per cent of its coal-fired generating capacity in Spain by 2020. It announced recently in its 2019-2021 strategic business plan that it would also invest €2 billion in renewable energy.

According to Scope Ratings, tighter binding renewable energy targets adopted by the EU will help to drive investment in renewables and will also expose utilities with carbon-emitting power plants in their portfolios to greater risk.

Some countries have pledged to phase out coal fired power generation, while others are considering limiting which power plants can take part in capacity schemes according to stricter CO_2 emission criteria.

"The big change is that political risk is back centre stage, in the form of stricter environmental regulations and a more nationalist tone to energy policy which risk squeezing credit metrics in the years ahead," said Sebastian Zank, analyst at Scope.

Ørsted is planning to reach a global installed offshore wind capacity of more than 30 GW by 2030. It has also increased its 2025 ambition from 11-12 GW to 15 GW.

"We expect the global market for renewable energy to more than triple towards 2030," said Henrik Poulsen, Ørsted's CEO. "Our second growth platform is our onshore business, consisting of onshore wind, solar energy and energy storage. It's our ambition to create a leading North American company within renewable energy."

Enel's plans include increasing its wind energy portfolio from 8 GW in 2018 to 14 GW in 2021. Solar energy will increase from 2 GW to 5 GW.

Endesa said that it would increase its renewable installed capacity by 30 per cent over the 2019-2021 period, most of which will come from wind and solar projects. By 2021, the company intends to raise its total renewable installed capacity from 6.5 GW in 2018 to 8.4 GW, by adding 1.9 GW of new wind and solar capacity (of which 0.9 GW through 2017 auctions).

Endesa will close the 1051 MW Compostilla lignite fired power plant in Leon, whose units were commissioned between 1961 and 1984, and the 1101 MW Andorra coal fired power plant in Teruel, which started operations in 1970.

The move is a key part of Endesa's plans to reduce its CO_2 emissions by 47 per cent by 2020 compared with 2005 figures and by a further 44 per cent between 2020 and 2030, in order to entirely decarbonise its asset base by 2050.

Hitachi buys ABB grid unit in shift away from nuclear

■ Hitachi diversifies with grid business
■ ABB sets focus on digital sector

Hitachi's purchase of ABB's power grid division will help the Japanese technology firm to shift its focus away from nuclear plants, it says.

The two companies have agreed a deal in which Hitachi will acquire 80.1 per cent of ABB's power grid business in a deal worth $11 billion. ABB said that the deal would expand an existing partnership between the two companies and enable ABB to focus on its digital industries business.

Under the deal, ABB will retain ownership of 19.9 per cent of the business for up to three years after the deal closes, expected in 2020. It intends to return all of the estimated net cash proceeds of $7.6-7.8 billion from the 80.1 per cent sale to shareholders.

Hitachi said that the acquisition will help it to overhaul its business and diversify into the fast-growing grids business. The acquisition is the largest in the firm's history, and Chief Executive Officer Toshiaki Higashihara hinted that more deals could follow.

"Power Grids will strengthen Hitachi as global leader in energy infrastructure and Hitachi will strengthen Power Grids' position as a global leader in power grids," said ABB CEO, Ulrich Spiesshofer. "To compete in today's fast-changing world, we fully empower our businesses, through the discontinuation of the legacy matrix structure ensuring zero-distance to customers and increasing our agility in decision-making.

"The continued simplification of our business model and structure will be a catalyst for growth and efficiency in our businesses."

Shell stake in Cleantech Solar paves path into Asia

Oil and gas major Shell says it will help to drive the development of Asia's solar energy sector through the acquisition of a 49 per cent stake in Cleantech Solar.

The Singapore-based firm is one of the largest solar energy developers operating in southeast Asia, with more than 120 solar power plants across the region. It said in a statement that the deal will give Shell "an immediate path to an established commercial and industrial platform in Southeast Asia and India".

The deal is Shell's second foray into solar in 2018 following an investment in Silicon Ranch Corporation, one of the USA's largest independent solar project developers. It has an option to expand its ownership stake in Cleantech Solar after 2021.

"We are very impressed by Cleantech Solar's record of developing lasting relationships with multinational and regional corporations who are eager to implement subsidy-free renewable energy into their corporate strategies," said Marc van Gerven, Shell Vice President of solar and storage. "Asia is a significant commercial and industrial solar generation market for Shell and we are proud to work with Cleantech Solar as a leading solar company in the region."

SSE and Innogy reassess future following merger cancellation

SSE is reassessing the future of its retail business unit after the firm cancelled plans for a merger with Innogy.

The two companies announced plans in late 2017 to merge their retail businesses to create a new, independent energy supply company in the UK market.

However negotiations over the commercial terms of the deal stalled over the provision of financial support to the new company. SSE said it decided to exit the deal as it did not believe the new company would be able to meet trading collateral requirements and would not be able to gain a premium listing.

"We closely monitored the impact of all developments and continually reviewed whether this remained the right deal to do for our customers, our employees and our shareholders. Ultimately, we have now concluded that it is not," said Alistair Phillips-Davies, Chief Executive of SSE.

"We believed at the time it was the right thing in terms of what we saw. There was a significant prize to go for," Davies added. "But market conditions changed over the past 13 months."

Davies cited the highly competitive retail environment as one of the challenges for the new company, alongside the introduction of a price cap mechanism on some types of tariffs in 2019. He said that the company would continue to investigate options for the future of its retail arm.

Innogy, which is owned by RWE but due to be sold to E.On in 2019, said it was also assessing options for the future of its British retail arm.

The failure of the merger is further evidence of a very competitive trading environment in the utility sector, according to analysts.

Professor David Elmes, leader of the Warwick Business School Global Energy Research Network said: "When SSE and npower proposed their merger, there were concerns that this was bringing together two of the 'big six' energy companies and the debate focused on how this might affect the choices on offer to customers.

"This missed the point that both companies had found running a profitable retail business challenging and this was a move to combine their customer businesses and hopefully make a new firm that would be more successful.

"Since the deal was announced, we have seen the government impose a price cap on the sector and we're starting to see the impact that's having on company profits.

"The fact that eight energy companies have collapsed this year reflects just how hard it is to run a viable retail energy business in the UK.

"These eight failures among the smaller energy retailers, plus the collapse of the SSE-npower deal, show the government is struggling to support a sector that's essential to the UK economy."

Americas

Mainstream signs up Senvion

Senvion has signed conditional orders with global wind and solar development company Mainstream Renewable Power for 81 Senvion 4.2 MW wind turbines in Chile.

Senvion's project scope includes the delivery, installation and commissioning of 37 of its 4.2M148 turbines for the Tchamma project and a further 44 Senvion 4.2M118 units for the Cerro Tigre project. The deal also includes a 20-year full service contract.

The contracts are the largest order intake for the newly launched Senvion 4.2M148 and will likely become firm in 2019. These projects comprise the first of three phases for Mainstream's fully-contracted 1.3 GW wind and solar platform awarded in the Chilean energy auction in August 2016. The installation of the projects of the first phase is planned for 2020.

AES gives second nod to Nordex

The Nordex Group has received a follow-up order in Argentina from AES Generación, it has announced.

Nordex will provide 24 of its AW132/3465 turbines for the Vientos Neuquinos wind farm in Neuquén, southwest Argentina, which is being developed by AES. The order follows a September 2018 order from AES for 30 Nordex AW132/3300 wind turbines for the Energética wind farm in Argentina.

Nordex recently announced plans to collaborate with Fábrica Argentina de Aviones to establish a local manufacturing facility in Argentina. The company said that the move would help to improve its competitiveness in the country.

Wärtsilä supports Aruban goals

Wärtsilä has been contracted to deliver a dual fuel power plant to the Caribbean island of Aruba.

The 102 MW plant has been ordered by the local utility, Water-En Energiebedrijf Aruba N.V. (WEB), and will enable WEB to reduce its use of heavy fuel oil (HFO) and integrate renewable energy capacity into its grid.

The power plant will consist of six Wärtsilä 50DF dual fuel engines. They will initially operate on HFO, reverting to liquefied natural gas (LNG) when that fuel becomes available on the island.

Wärtsilä will supply the plant on an engineering, procurement and construction (EPC) basis. Delivery is scheduled for the fourth quarter of 2019 and it is expected to be fully operational by February 2020.

Casa dos Ventos opts for Vestas

Danish wind turbine supplier Vestas Wind Systems has received a 151 MW firm and unconditional order for the Folha Larga wind project in the Brazilian state of Bahia.

Vestas will supply 36 of its V150-4.2 MW wind turbines for the project. Casa dos Ventos has also contracted Vestas to operate and maintain the machines over the next 20 years.

Deliveries are expected in the first quarter of 2020, while commissioning is scheduled to occur by the end of the second quarter of the same year.

Asia-Pacific

Suzlon wins Atria order

Suzlon has secured a maiden order from Atria Power for a 50.4 MW wind power plant in Tamil Nadu, India.

The project will comprise 12 of Suzlon's S111-140M and 12 of its S120-140M machines installed on hybrid lattice tubular towers at a site in Tuticorin. The wind farm will be commissioned in two phases by the end of the first half of 2020.

GE bags 300 MW in India

ReNew Power has placed an order with GE Renewable Energy to provide 120 wind turbines for the Gadhsisa wind farm in Gujurat, India.

GE will provide ReNews Power with its 2.5-132 turbine hardware for the 300 MW project. The project represents the largest full turnkey engineering, procurement and construction (EPC) project by GE Renewable Energy in India.

ReNew Power successfully bid for the wind farm project in the third round of auctions conducted by the Solar Energy Corporation of India (SECI) in February 2018. The project is due to be commissioned progressively, starting at the end of 2019.

Nexans cables reinforce Philippines grid

Nexans has been awarded a full turnkey contract to reinforce the national grid of the Philippines.

Nexans' scope includes manufacturing, delivery and installation of 350 kV high voltage direct current (HVDC) mass-impregnated (MI) submarine cable in water depths of up to 650 m for the submarine link of the Mindanao-Visayas Interconnection Project.

The National Grid Corporation of the Philippines (NGCP) launched the Mindanao-Visayas Interconnection Project (MVIP) to connect the three power grids of Luzon, Visayas, and Mindanao into one unified national grid. With the completion of the MVIP, expected by 2020, NGCP aims to ensure a more stable and secure supply of power in the country and maximise the use of available local energy resources.

Pöyry wins Vietnam assignment

Phu Yen TTP Joint Stock Company has awarded Pöyry an owner's engineer services contract for the Hoa Hoi solar photovoltaic (PV) power plant project in Phu Yen province, Vietnam.

The project consists of a total of 257 MWdc solar photovoltaics and a 220 kV electrical interconnection, constructed on 260 hectares of land in the south central coast area of Vietnam.

Pöyry's assignment includes assistance in project management, design review, and site supervision services during construction and commissioning.

The expected duration of the project is nine months.

"We are proud to have been chosen by B. Grimm and Truong Thanh Vietnam Group as their owner's engineer for this important project, which is one of the largest solar PV projects in southeast Asia.

This project further strengthens Pöyry's role in supporting the renewables boom in the southeast Asian region, where we have so far been involved in more than 4000 MW of solar and 3000 MW of wind power projects," said Petteri Härkki, Regional Director of Pöyry.

Europe

Sellafield selects Wood

Services company Wood Group has won a $66 million contract to supply digital control technologies to the Sellafield nuclear site in Cumbria, UK.

The 10-year contract covers all stages of system design, manufacture and assembly of equipment, obsolescence management and maintenance support for project work and decommissioning carried out by Sellafield.

"Securing this important framework is proof of the rationale for acquiring Amec Foster Wheeler 12 months ago and a good revenue synergy," head of specialist technical solutions Bob MacDonald said.

Pori opts for Valmet automation

Valmet will supply automation technology to Pori Energia Oy's Aittaluoto biomass power plant in Pori, Finland.

Pori Energia has established a project to replace its outdated power plant process systems, decrease the use of fossil fuels and meet the operational requirements of local industries. The modernisation will decrease the CO_2 emissions of the Aittaluoto power plant by 88 000 tons annually. Valmet's automation will improve plant availability and emissions control.

Valmet's delivery will include a Valmet DNA automation system, a safety system and an information management system with applications for emissions control and boiler performance monitoring. Additionally, the delivery includes system engineering, installation, commissioning and training.

The modernised biomass power plant will start its operation in the summer of 2020.

Vestas secures first order from enercity Erneuerbare

Vestas has received a 33 MW order from German municipal utility enercity Erneuerbare GmbH, a subsidiary of Hannover-based utility enercity AG, for the Klettwitz III B.A. 2.2 project located in Klettwitz in the Brandenburg region in eastern Germany.

The Klettwitz III B.A. 2.2 is an extension of the existing Klettwitz park and will make a significant contribution to the German energy transition, said Ivo Grnhagen, CEO of enercity Erneuerbare. The project will comprise ten V117-3.3 MW turbines, which will be installed on a former coal surface mining area.

The contract includes supply, installation and commissioning of the wind turbines, as well as a 15-year Active Output Management 4000 service agreement. The project will feature the VestasOnline Business SCADA solution to lower turbine downtime and optimise the energy output.

Deliveries are scheduled for late 2019 and early 2020.

ABB solution for EV battery plant

LG Chem has selected ABB to provide a substation for Europe's largest electric car battery factory in Poland.

The new car battery plant in Kobierzyce, near Wroclaw will be capable of supplying up to 250 000 electric cars with batteries per annum. It is also the first large-scale lithium-ion battery plant for automotive applications producing all battery components, from electrodes to cells, modules and packs.

ABB will be responsible for key equipment supplies including transformers, surge arrestors and gas insulated switchgear.

Siemens wins UK grid order

Siemens has been awarded an order to connect the Moray East offshore wind farm to the grid.

The contract represents Siemens' largest UK offshore grid connection deal to date. The company will deliver an onshore substation and three offshore transformer modules for the 950 MW project.

Moray East is being developed by a joint venture company owned by EDP Renewables, Engie, and Diamond Generation Europe Ltd., a subsidiary of Mitsubishi Corporation. Siemens will be responsible for the onshore substation including three SVC Plus as well as the three offshore substation platform topsides. It will also install a 30 km underground cable to the onshore su station at New Deer in Aberdeenshire for the power generated.

International

Kipeto reaches financial close

The 100 MW Kipeto wind farm in Kenya has reached financial close, GE has announced.

The US energy giant says that the flagship project will be funded by equity from Actis and a Kenyan company, Craftskills Wind Energy International, alongside senior debt from the Overseas Private Investment Corporation (OPIC), the US government's development finance institution (DFI).

Kipeto is expected to reach commercial operation in 2020 and will provide clean energy to Kenya's national grid through a 20-year power purchase agreement with Kenya Power and Lighting.

GE Renewable Energy will provide 60 of its 1.7-103 turbines for the project, as well as operations and maintenance services.

H turbine set for UAE smelter

Siemens has signed a contract to build a new combined cycle gas turbine plant in the United Arab Emirates using its H-class gas turbine technology.

The contract marks the first time the company's H-class gas turbine will be used in the Gulf region, Siemens said, adding that the plant will be the most efficient of its kind in the UAE.

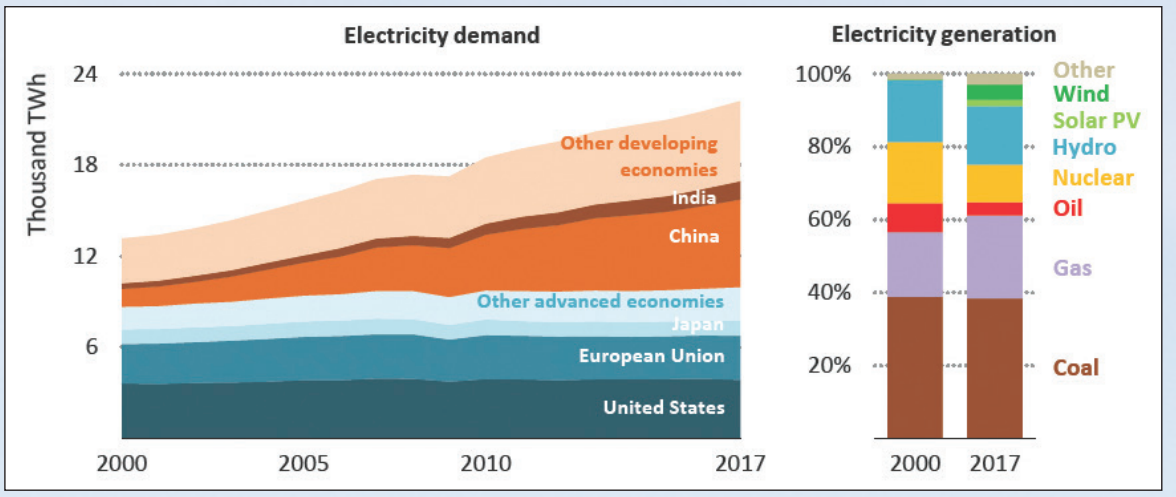
Under the contract, Siemens will build the new, 600 MW plant at Emirates Global Aluminum's smelter in Jebel Ali, Dubai. The H-class power plant is expected to cut greenhouse gas emissions from EGA's power generation at Jebel Ali by 10 per cent. NOx emissions are expected to be reduced by 58 per cent.

SGRE signs second order with Enel in Russia

Siemens Gamesa Renewable Energy (SGRE) has secured a second order in Russia from Enel Russia for the supply of 201 MW of wind turbines.

The scope of the agreement includes supply, installation and commissioning of 57 Siemens Gamesa 3.X platform turbines at the Kola wind farm, located in Murmansk region, Russia. The Kola wind farm is due to be commissioned in 2021. The contract includes full scope operation and maintenance services during the first two years with an option to extend.

Global electricity demand by region and generation by source, 2000-2017



World Energy Outlook 2018, © IEA/OECD, Figure 7.1, page 281

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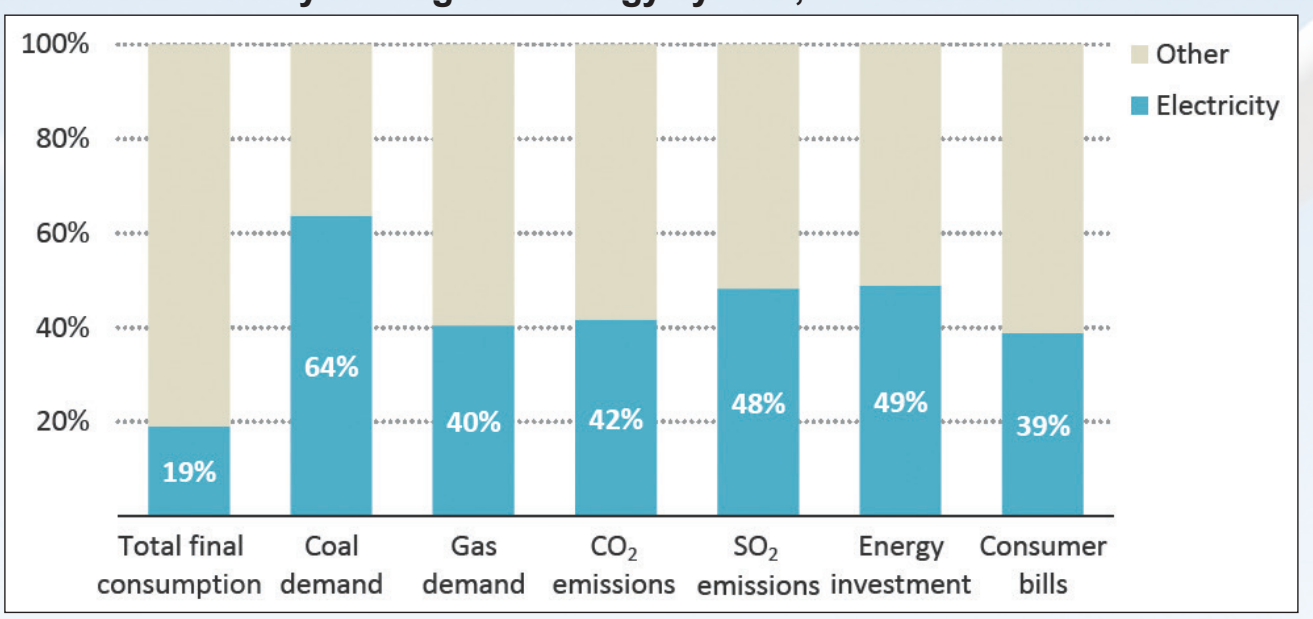
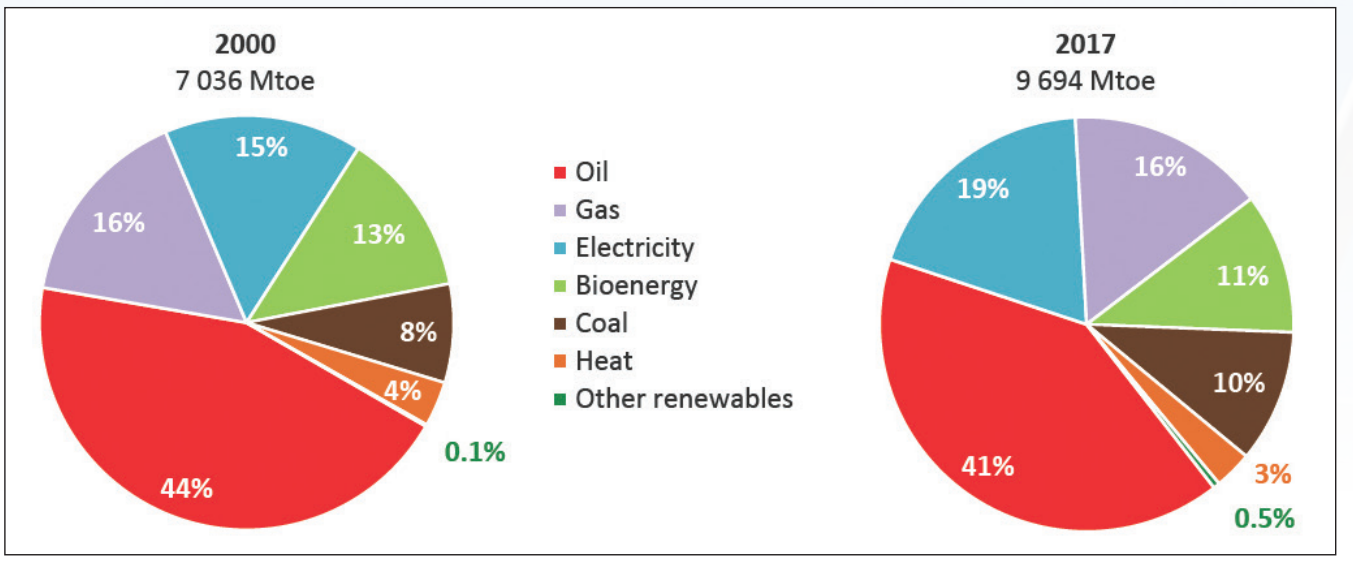
Share of electricity in the global energy system, 2017



World Energy Outlook 2018, © IEA/OECD, Figure 7.2, page 284

Total final consumption, 2000 and 2017



World Energy Outlook 2018, © IEA/OECD, Figure 7.3, page 285

Source: World Energy Outlook 2018

Oil

Oil market stability the big question for 2019

- Oil demand may fall as fears of recession loom
- Opec and non-Opec allies agree to renew production cuts

Mark Goetz

Crude oil prices have taken a plunge over the last few months, provoking worries within the oil industry while commodities are wrestling with a bear market. There is a growing consensus in the media that the global economy is weakening and some commentators are forecasting the advent of a new recession for the months ahead. Fears of a looming recession are contagious to the oil market, the thinking goes. As the global economy winds down, demand for oil will decline – hence prices will fall, especially if there is too much oil supplying the market.

Since early October, crude prices have fallen by around $30/b – from more than $86/b for Brent and $76/b for West Texas Intermediate (WTI) to around $56/b and $46/b, respectively in mid-December. Much of the extra oil has come about as the result of an increase in output by oil producers in anticipation of US sanctions against Iran taking effect in November. Washington talked tough about forcing Iranian crude exports down to zero, but when the sanctions went into effect Washington granted six-month waivers to countries whose economies are highly dependent on Iranian oil imports.

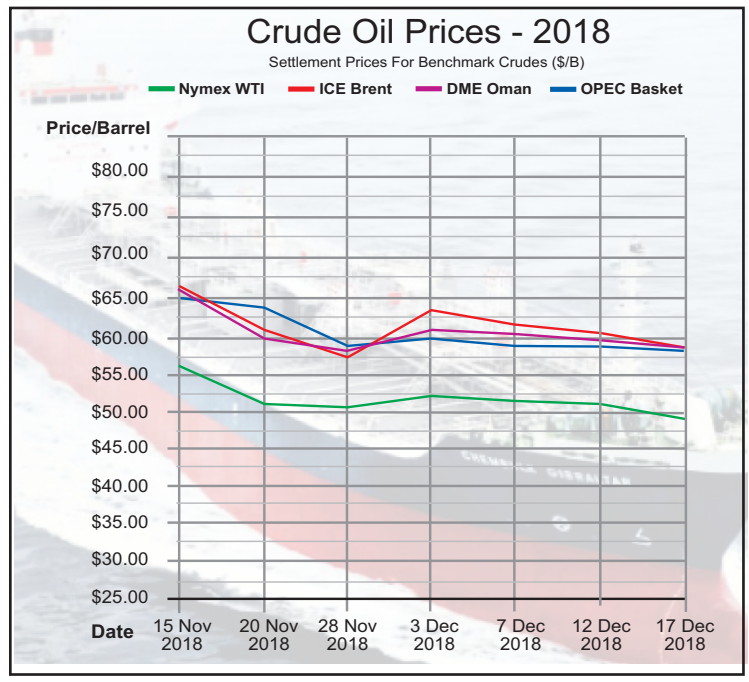
Opec, led by Saudi Arabia, and its non-Opec allies, led by Russia, met in Vienna in early December and agreed to renew production cuts in order to halt the decline in oil prices, which at that time were thought to have 'stabilised' at a price of around $60/b for Brent and $51/b for WTI.

The oil ministers agreed to cut output by 1.2 million b/d as of January 2019 – 800 000 b/d from Opec, most of which will come from Saudi Arabia, and 400 000 b/d from non-Opec countries. As with the previous effort to cut production that was launched in January 2017, this latest move is meant to stabilise oil prices and 'balance' the oil market to the degree that supply meets demand.

Despite tales from yesteryear when experts predicted that the Earth was running out of oil, there now seems to be an abundance. The US, Saudi Arabia and Russia are all producing more than 11 million b/d, accounting for about 40 per cent of global production. The US government, of course, makes no effort to curb production, letting the market determine price and output, but Riyadh and Moscow have taken to shaving production because their economies depend on oil export revenues.

In its latest 'Oil Market Report', the International Energy Agency (IEA) noted that volatile prices are not in the interest of producers or consumers. It also pointed out the growing role of the US in its ability to influence the oil market in the future. It noted that during the last week of November, the US became a net exporter of crude and products for the first time since 1991.

The IEA said the trend regarding US involvement in the market is clear, stating that in 2018, US net imports averaged 3.1 million b/d, but that 10 years ago, before the state of the shale oil and gas revolution, the US was importing 11.1 million b/d.



"As production grows inexorably, so will net imports decline and rising US exports will provide competition in many markets, including to some of the countries meeting in Vienna last week," the report said. According to the US Energy Information Administration (EIA), US crude oil production will exceed 12 million b/d in 2019.

The big question is whether the Opec/non-Opec production cut will actually bring the market back into balance before the group meets again next April. Russia was slow to comply with the 2017 cutback and it now says the winter conditions in Siberia could prevent it from implementing its promise to trim 230 000 b/d as of January. It remains to be seen how fast the other countries party to the agreement will move to comply.

There are the unforeseen outages such as the recent ones in Canada and Libya, but these circumstances are unplanned and neither are signed up to cut production. Libya is an Opec member, but it is exempt from any obligation to a production cut.

There is also the unknowable course of the US-China trade war, which could dampen oil demand and put more downward pressure on connected economies.

The Opec/non-Opec plan to remove 1.2 million b/d from the market starting in January has already come under criticism as being too small to have the desired impact on prices. It's been argued that at least 2 million b/d needs to be dropped in order to see a solid stabilisation. But the oil market is never really stable. By stable, what the oil producers mean to say is "the highest price possible."

Gas

Asian LNG demand set to boom, as US exporters gear up

The action taken by Asian buyers will be instrumental in ensuring that the next generation of LNG supply is brought to market, and a considerable amount of that next generation capacity will come from the US.

David Gregory

Demand for LNG among the world's major buyers, all of which are located in Asia, is expected to surge during the next decade.

Research carried out by Edinburgh-based Wood Mackenzie shows that uncontracted demand by the world's seven largest LNG buyers could quadruple by 2030 to 80 million tons per year. Long-term contracts are beginning to run out and buyers will be looking for a mix of suppliers in order to lower costs and diversify sources, the consultancy stated in a recent report.

"As China pushes on towards a lower-emission economy, its demand for gas and LNG has grown significantly and we expect the trend to continue in the longer term," research director Nicholas Browne said in a statement. "Other traditional major buyers, on the other hand, are facing legacy contract expiries and will be on the hunt for a mix of contracts to lower average costs and security in supply sources," he said.

Wood Mackenzie identified the seven main buyers, who account for over 50 per cent of the global LNG market, as CNOOC, CPC, JERA, KOGAS, PetroChina, Sinopec and Tokyo Gas.

LNG suppliers will be tasked with addressing the changing needs of customers, the consultancy said. Buyers are going to be looking for a variety of contracts that meet different needs. Under consideration will be factors such as price, contract flexibility, index, source diversification, upstream participation and seasonality.

"Market liberalisation and uncertainty on longer-term demand in more mature markets, such as Japan, South Korea and Taiwan will mean more room for spot and short-term purchases," Browne said.

"While oil indexation will continue to dominate markets due to familiarity and ability to hedge, Asian buyers should be more inclined towards hub indexation to boost diversity and enable sales into Europe," he said.

The action taken by Asian buyers will be instrumental in ensuring that the next generation of LNG supply is brought to market, Brown said. A considerable amount of that next generation capacity will come from the US, where the shale gas boom has launched an LNG export industry that is just beginning to take off. US exporters hope to see their way into Europe, although cheap piped gas from Russia will pose serious competition.

Nonetheless, US LNG companies have their eyes focused on the Asian market, but the trade dispute between Washington and Beijing could complicate sales to China, which is viewed as the real growth market as China switches to gas from coal to curb carbon emissions.

A report issued by the US Energy Information Administration in early December said the US would become the third-largest producer of LNG by the end of 2019, behind Qatar and Australia. Export capacity will jump from a current capacity of 3.6 billion cubic feet per day (bcf/d) to 8.9 bcf/d by the end of next year, the EIA said, adding that by the end of 2018, export capacity could reach 4.9 bcf/d as two new LNG trains become operational.

LNG export from the lower 48 states began in February 2016 with the opening of the Sabine Pass terminal in Louisiana. Over the last two years, Sabine Pass has expanded to four trains and the Cove Point, Maryland, export terminal came into operation. A fifth train at Sabine Pass and the first train at Corpus Christi, Texas, were scheduled to ship their first cargoes by the end of 2018. Two LNG facilities, Cameron LNG, Louisiana, and Freeport LNG, Texas, are in the process of being commissioned. Three trains at Cameron and two at Freeport are expected to be working by end 2019.

During 2019, the Elba Island, Georgia, export terminal, comprised of 10 modular trains, will come into operation, as will a second train at Corpus Christi, followed by a third train at Freeport LNG and another at Corpus Christi in the second quarter of 2020 and 2021, respectively.

Four more export terminals have been approved by the US Federal Regulatory Commission and the US Department have been approved – Magnolia LNG, Delfin LNG, Lake Charles, and Golden Pass, plus a sixth train for Sabine Pass. These projects will add a further 7.6 bcf/d to export capacity.

It is estimated that by end 2020, the US could have an LNG export capacity of 71 million tons per year. That compares with Qatar's current capacity of 77 million tons per year and certainly poses a challenge to the Gulf state and other traditional suppliers such as Australia, Malaysia, Indonesia and Algeria.

Understanding the invisibles

As the face of the energy sector continues to change, *TEI Times* caught up with Edison Electric Institute's Dr Lawrence E. Jones to discuss his views on some of the industry's challenges and key issues that will shape it as it moves forward.
Junior Isles

The three 'D's – decarbonisation, decentralisation and digitalisation – are very interesting but what are we missing? Do they have unintended consequences hidden in what we cannot see?" It is a thought-provoking question posed by Dr Lawrence E. Jones, Vice President International Programs, Edison Electric Institute (EEI), as he speaks about "understanding the invisibles" and why "what we can't see defines what we see".

Dr Jones, who was in London to participate in the Transatlantic Dialogue on Cyber Security Strategy and Preparedness co-organised by EEI and UK Power Networks, starts by explaining that for the 'D's to work, we have to focus on the 'I's – integration, interdependence, independence, interconnectivity, intelligence, interoperability and innovation.

"These 'I's are very important. The 'D's are at the big picture, macro level but at the end of the day, you have to think about integration… and in particular innovation; the invisible innovations that keep this energy industry going and in fact keeps society functioning."

While many might not see the energy industry as innovative, Dr Jones points out that there is an incredible amount of innovation that goes into the technology and physical infrastructure behind lighting a room through the simple flip of a switch. Yet because that technology is not seen, it is not viewed as innovative and not valued by society in perhaps the same way as an iPhone.

"The 'D's sound great but it's all the things behind that you don't see that are the things that are really shaping what's happening in our world. The challenge we have is: what do we have to do to make the invisible more visible and therefore valued in a way that it's OK to pay for the invisibility that actually keeps the lights on?"

Indeed, not recognising the value of things that are commonly taken for granted in developed countries can present difficulties. For example, a utility can sometimes face challenges when securing support for investing in physical infrastructure.

"A lot of what we do is predicated on having a physical infrastructure that works… but investments in the physical infrastructure have to be paid for," explains Dr Jones. "Your stakeholders – regulators, consumers, investors – have to understand that investments, backed by good returns, need to be made in the invisibles because of the value they create. But people want services to be provided at an ever-cheaper cost. It sometimes becomes difficult to make the business case for, say, modernising electricity infrastructures when the stakeholders just don't see it. Yet having an electricity system that is consistently at least 99.9 per cent reliable is only possible by investing in those invisibles…?"

So what are some of those invisibles that are becoming increasingly important? Dr Jones points to technologies such as artificial intelligence (AI), machine learning, autonomous systems, data analytics, smarter grid equipment, and hyper-personalisation.

He explains: "Today almost everything you do is controlled by an algorithm. In our business, I call these the algorithms that light up the world. The sad thing is, you may not even know these algorithms exist. But those are the innovations that are driving our industry, driving the transition."

But as society moves to a scenario where everything can be measured to furnish increasing amounts of data and create digital twins to improve system modelling, simulation and control, Dr Jones fears there is a danger of moving to a world where we "over-value the digital" and under-value the physical". The problem, he says, is the "value lens" used by stakeholders.

"If you look at a lot of stock market valuations of companies today, you will see that a lot of those companies valued at billions of dollars have a digitally-based business model; they don't own any physical assets. The Facebook and Ubers of the world have huge market capitalisation and all they are offering for the most part – the deliverable – is an experience or, in some cases, information. I'm not saying it's not important; it's what people value. But why is it that the physical infrastructure, something that is so fundamental to modern society, is less valued by the market and society at-large?"

Indeed it is perhaps a strange value lens that society uses, since the digital world cannot exist without the physical world. In some countries, it is perhaps more easy to appreciate the digital world because the physical world has already been built. However, this built environment must be ma
intained and upgraded.

He says it is an issue that needs serious consideration when thinking about decentralisation. Digitalisation is a major driver and facilitator of decentralisation. The creation of virtual power plants through the aggregation of devices and the technology needed to create smart grids to enable prosumers, and micro-grids where users can conduct peer-to-peer transactions, are all part of the digitalisation movement.

But Dr Jones is not convinced that the future is purely decentralised. As the world's population grows and mega-cities become even larger, he asks: "When you think of urbanisation and a world with 10 billion people, the question is: can you run a world with 10 billion people on decentralised power?

"As those populations grow, how can we provide electricity in those large urban areas where there are not enough rooftops or land [for solar panels] for providing electricity? And there will be times when the sun doesn't shine or the wind doesn't blow. So we should be careful not to create an either or scenario."

Dr Jones believes the future is "hybrid", a mix of centralised and decentralised solutions. He warns, however, that in this "age of hybridity" – where there is a mix of centralised and decentralised systems and the digital world is integrated with the physical world – there are issues that need to be seriously considered.

"There will be a need for greater coordination in terms of planning because there is an interdependency. No one builds a micro-grid with the goal of it continuing to run as a micro-grid. People ultimately want a micro-grid to expand – who builds a micro-grid to serve just one customer? So we have to consider how the micro-grid will interact with the macro-grid and vice versa. So there has to be more integrated planning of hybrid systems."

He says new approaches to planning are being looked at around the world. "Research institutes are looking at it, and utilities and network operators themselves are beginning to look at it and incorporate it into their thinking and planning. If you don't take a holistic approach, it sometimes becomes difficult to see the true value of everything along the value chain, or more increasingly the value networks."

He added: "We haven't found a way to come up with the analytical, legal frameworks, etc., to assess the merits of these hybrid systems together, as one… The digital and physical worlds are coming together but, in general, we still address them as silos.

"If you look at the investment model for investing in the physical world, they are long-lived assets. A transmission line, for example, is designed to last many years. But the time horizon for investment in the digital world is different, so you have to have a more integrated approach when assessing the merits of the 'digital-physical' world."

One major concern in the area of digitalisation, and the proliferation of digital twins in particular, is the issue of data – its accuracy and privacy. "Inaccurate data means inaccurate behaviour of the twin," he said. "The other important thing is cyber security, making sure you can secure the protection of that data. This has to be key."

The move to digitalisation has potential ramifications that reach far and wide, leading Dr Jones to pose several interesting questions.

"Why should we care about the black boxes? Those invisible algorithms are doing stuff you don't know about. What happens when the algorithms autonomously generate new algorithms that function in a way that defies legal and regulatory frameworks? Regulators are in trouble because they have no understanding of these algorithms. What if AI gives biased results based on biased information? What does that mean for how systems will evolve? And what happens if the predictive analytics give a wrong prediction?"

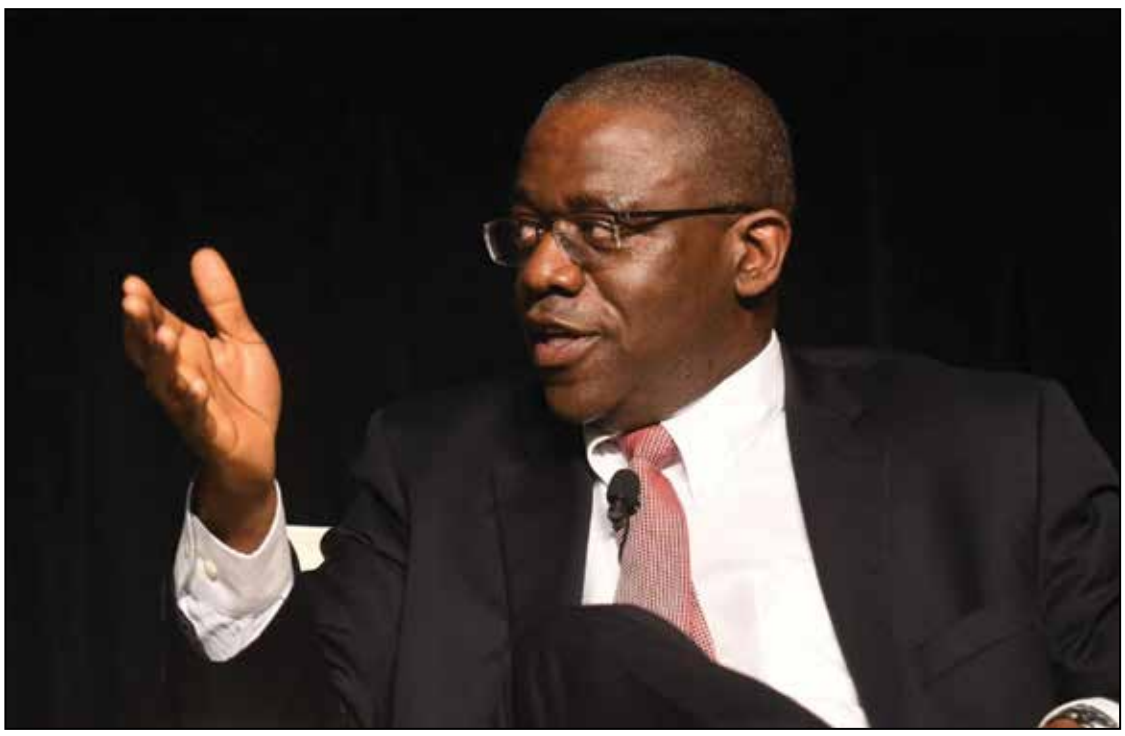
In the power sector, this could be a huge issue in forecasting. In a traditional power system, network operators are able to balance supply and demand because they have a good understanding of the demand, its location and the rate at which it goes up and down. But in a more digitised, decentralised, world it is not so straightforward.

Dr Jones observes: "When we don't have that level of sophistication, we start to rely on predictive analytics to help forecast the behaviour of all those interconnected devices. So if our prediction of a certain pattern, for example a consumption pattern or charging/discharging pattern, is wrong, what's the recourse? It becomes an interesting scenario, even in terms of regulatory framework. If a regulator designs a bad framework because they are unable to do holistic scenario planning for what the world will look like, there could be implications."

Moving forward, Dr Jones says the global industry should adopt industry-specific solutions and business models. While he believes that blockchain, for example, has its merits, talk of it being the game-changing technology for the energy industry is perhaps "a little overblown". Neither does he believe that platform approaches such as those used by Uber are really suitable.

He concluded: "Uberisation and other digital business models do not necessary lend themselves to some of the physical things we'd like to do in energy… digitalisation in terms of improving operations is important but I don't see how some of these models that don't require a physical system can be applied to the energy sector.

"I'd like to consider myself a realistic energy futurist. We have to adopt solutions that reflect the needs and expectations of the customer in a given industry environment. While the 'D's of the energy transition are global in scale, the 'I's which are key to realising the transition are local in character. Welcome to the age of hybridity!"



Dr Jones: "It's all the things behind that you don't see that are the things that are really shaping what's happening in our world."

Creating a winning hand

Micro- and mini-grids based on renewables are seen as the route to electrifying regions like Africa, where many people have no access to electricity. This thinking has led several reciprocating engine manufacturers to tie-up with energy storage providers aimed at delivering hybrid solutions for remote sites and rural communities.

Junior Isles

As the cost of electricity from wind and solar in particular continues to fall, renewables are being touted as a solution to electrifying the African continent's many countries that still have no access to electricity.

Certainly the use of renewables is gaining momentum in Africa as those countries see the possibility of bringing electricity to rural communities through microgrids based on renewable energy, thus avoiding the need to extend the national grid. It is a trend that is also one of the drivers behind the move by several genset companies to tie-up with energy storage companies to offer hybrid solutions for the renewable energy space.

In 2017, Wärtsilä closed its acquisition of energy storage company, Greensmith Energy Management Systems, while engine rental company, Aggreko, bought Younicos. More recently, in a move to expand its position in the micro-grid market, Rolls-Royce acquired a stake in Berlin-based energy storage start-up Qinous.

Commenting on Africa and the move towards an electricity system based on renewables, Qinous co-founder and Head of Business Development Busso von Bismarck said: "I strongly believe Africa will leapfrog the traditional approach to electrifying countries through grid extension, simply because it is much cheaper do it in a decentralised way... energy storage alongside solar or wind – will play a major part in such a development."

Established in 2013, Qinous has developed a standardised package that is well suited to the needs of many of the off-grid communities found in African countries and other emerging markets, and could also be used in commercial and industrial applications. In Africa, the company is already active in Madagascar, Tanzania, Kenya and is in talks in Mali.

"The idea is to offer a turnkey solution where everything is integrated in a container, including the micro-grid management, that can be installed quickly. This is how we think the issue of micro-grids in remote areas should be addressed," said von Bismarck. "Our focus is in the 30 kW to the single digit megawatt power range, and addressing this market is only economically viable with standardised products."

Rolls-Royce's investment in Qinous makes sense on several levels but mostly because it enables a traditional technology such as reciprocating engines, which are commonly found in African countries, to be integrated with renewable-based microgrids. Not only does such an approach bring cleaner electricity, it also lowers the cost of energy and introduces reliability into the system.

"The genset producers and suppliers have understood that there is no way to carry on with business as usual, mainly because solar has become cheaper than anyone could have ever imagined. We can now produce solar electricity at around 4-8¢/kWh; diesel [generation] is around 30+ ¢/kWh," noted von Bismarck. "But you can only integrate solar into a diesel micro-grid to around 15 to 20 per cent on an annual average without energy storage. If you want to go further, you need to be able to switch off the genset during the sunshine hours and allow a 100 per cent solar penetration… but you need the genset to form a stable grid. You therefore need another device to takeover the role of the genset – this is the energy storage system."

Matti Rautkivi, Director of Sales & Marketing at Wärtsilä Energy Solutions, has a similar outlook on the rationale for renewables and storage but expanded on how diesel engines fit into the picture. He used Senegal as a good example of how African countries can make the transition to renewables-based electricity systems through the use of engine-based technology.

Currently, Senegal's electricity access rate is 64 per cent and there are 1.1 million homes without power. While 90 per cent of its urban population has access to electricity, power only reaches 44.5 per cent of the rural community, according to data from USAID (United States Agency for International Development).

The country is largely reliant on oil products such as imported crude for electricity, yet it is one of only a handful of places on Earth that has the resources to produce substantial amounts of wind and solar power at the same time. According to the Ministry for Renewable Energies, solar irradiation is above 2000 kWh/m^2/year for Global Horizontal Irradiation and above 1800 kWh/m^2/year for Direct Normal Irradiation for most of the country. There is also substantial wind energy potential along the coastal strip between Dakar and St. Louis.

Notably, the government has made power sector development a key component of its Plan Sénégal Emergent, which aims to make Senegal an emerging economy by 2025. Priorities include lowering the cost of generation by reducing dependence on imported liquid fuels and increasing electricity access – particularly in rural areas.

Senegal is one of about 70 power systems modelled by Wärtsilä to assess the optimal and most economical generating mix for various countries. Rautkivi said: "For Senegal, our study looks at what would be the optimal from 2018 to 2038 and what should be built – whether it should be new coal plant, new LNG, HFO or renewables. All the models show that Senegal should invest in significant amounts of renewable energy – it should build, easily, up to 80-90 per cent."

According to Rautkivi, renewables are already cheaper than the country's coal fired generation. He stressed, however, that it is not purely an issue of cost. The generation system also has to be capable of despatching reliable power.

"That's why we have done this system-level analysis for Senegal. You need to provide reliability as well as the lowest cost of electricity."

He says that the company's analysis shows that incorporating gensets into the system provides the optimal path to a 100 per cent renewable system that is reliable, sustainable and affordable. "Building HFO or gas plants provides the system flexibility and reliability today but also leaves room for renewables."

His thinking is that this approach basically enables a massive increase in renewables in a way that does not result in the problems seen in China, which is increasing renewable capacity but at the same time is still building base load coal plant. He explained: "Coal fired generation is inflexible by its nature, so that's why they can't add more renewables into the system or, if they do, there is the 30 per cent curtailment rate, which we are already seeing today.

"That's why we do this modelling – to find the most economical way to get to 100 per cent renewables. And building flexible capacity is key."

Again looking at Senegal, he says that the HFO plants that are running in base load today will change their operation as more renewables come on to the system, running less to provide system flexibility in the future.

Rautkivi therefore believes that the days of adding significant amounts of large inflexible generation in Africa are numbered. "Every power system will have a significant amount of renewables in the future. If only solar is available, it will take a little bit longer to get to 100 per cent renewables because we will have to wait until energy storage technologies become cheaper. But even if we only had solar PV [without storage], we can say that 30 per cent of electricity should come from solar-only systems."

There are those that would argue that fossil fuel systems, engine-based or otherwise, have no place in a world that needs to decarbonise as fast as possible, and countries should immediately pursue renewables plus storage and other forms of dispatchable renewable energy. Rautkivi noted, however that this would be "hugely more expensive" than a hybrid renewables-genset system, which also delivers flexibility. He noted that solar plus storage would start to become competitive from around 2027, when the cost of storage falls to around $125-150/kWh.

Countries like Senegal, however, where there are blackouts due to the gap between supply and demand, do not have the luxury of waiting for costs to come down. This is why Rautkivi believes they should invest in flexible genset-based generation as it provides the path to 100 per cent renewables in the most economic and optimal way.

While 90 per cent of Senegal's urban population has access to electricity, power only reaches 44.5 per cent of the rural community

Wärtsilä hopes its purchase of Greensmith will position it to serve markets like Africa now and in the future.

In addition to capturing opportunities globally, based on short duration battery storage projects, Rautkivi says right now there are opportunities for hybrid solutions where the company already has an installed base. These, he said, are in, for example, the mining sector, on islands, or in countries like Senegal. Earlier this year Wärtsilä installed a 130 MW Flexicyle power plant as part of Senegal's strategy to increase its energy production, while in the medium term, reducing the cost of electricity for consumers. Importantly, it says the plant will provide the flexibility needed to facilitate the integration of intermittent renewable energy into the country's network.

Rautkivi said: "In the next phase we will start to see the solar-energy storage packages, where we provide that block of renewable energy that can be shifted to the evening or morning periods."

With the price of renewables driving the change, making the case for a renewables-based system in Africa is becoming increasingly easier. Rautkivi concluded: "If people have to pay extra for sustainability in developing countries, it will be a challenge but if it comes with affordability there is less resistance against the change; then we have a winning hand."

Changing the game with ammonia-based fuel cells

A new fuel cell that uses ammonia to generate the hydrogen needed for fuel will be commercially available this year. **Junior Isles** discusses the potential impacts of its introduction.

Fuel cells have long been hailed as a technology that offers a way of providing standalone, zero-emissions, highly reliable power. Yet since their first commercial use by NASA nearly 60 years ago, they have failed to achieve widespread land-based use – largely due to cost and the lack of infrastructure for transporting the hydrogen typically needed to fuel the cells.

Israeli company GenCell Energy may, however, have found a way around these drawbacks with the development of what it claims is the world's first ammonia-based primary power fuel cell – the GenCell A5.

Overcoming the two main constraints of hydrogen fuel cells has been central to the A5's development from the outset. As Rami Reshef, CEO of GenCell Energy, noted: "When we founded the company in 2011, we asked ourselves: how can this emission-free, reliable technology become mainstream? We recognised there were two obstacles – one was capex because it was designed and built for space and based on platinum, and the second was the operational cost mainly because it was based on the fuel of the future, hydrogen. Hydrogen is a great fuel but you can't find it on every street corner."

GenCell's answer to the challenge was to develop an alkaline fuel cell that uses a special non-platinum catalyst that allows hydrogen to be extracted from ammonia (NH_3), a widely available chemical that is extensively distributed by pipeline and vehicles. According to Reshef, this is the first low-temperature fuel cell (operating at around 70°C) that is platinum-free.

The new catalyst, which allows the A5 to use ammonia, is a significant development. Reshef says not only will it help address recent environmental regulations banning the use of diesel in some countries but it also makes economic sense for power generation.

He said: "For the first time we have a fuel cell technology that is not only emission-free and reliable but the cost of electricity per kWh is less than diesel. And it is one that will allow us to approach both developed and developing societies with several solutions. It can be used for back-up applications up to primary."

He added: "Ammonia is all around us; it is the second most used chemical in the world… its uniqueness is that it is a hydrogen carrier. Our catalyst allows us to break the bond between the nitrogen and hydrogen atoms without the need for energy from the grid. Usually you can extract hydrogen from ammonia but you need to be connected to the grid and consume more kWh from the grid than the potential kWh you produce from the hydrogen you get from the ammonia."

Reshef sees the GenCell A5 as a "nano power plant" that can be located anywhere without any connection to the grid. It comprises a tank of ammonia that contains 75 per cent liquid ammonia, with the remaining 25 per cent in its gaseous ambient temperature form. A single 12-ton tank of ammonia provides enough fuel for a year of 24/7 operation.

The ammonia gas flows naturally to an ammonia reformer without any power from the grid. Inside the reformer, the ammonia goes through a "catalytic burning" or cracking process to produce nitrogen and hydrogen. The nitrogen and hydrogen both flow into the fuel cell, where the hydrogen is consumed in a redox reaction with oxygen, which is taken from the air, to produce electricity and heat. The nitrogen is released back to the atmosphere and the only by-product is water.

The reformer operates at a temperature of around 600°C, which can be recuperated to provide heating or cooling. This boosts overall system efficiency from around 52 per for electricity-only to about 80-85 per cent.

While the environmental advantage compared to diesel is clear, GenCell gave a detailed analysis of how the economic case stacks up. According to Reshef, although the initial capex is usually about 10-20 per cent more expensive, this is compensated for by a major saving in opex.

Depending on where it is in the world and the price of ammonia, he says the fuel cell generates power at around $0.5-0.7/kWh, which is "two to three times less" than diesel. He said: "When the system is running 24/7, it's like having a money-making machine." He also noted that unlike diesel, where taxes are increasing, the price of ammonia is stable at around $350-580/t.

Using the telecoms sector as an example, i.e. in base stations located at off-grid sites, for 1000 base stations GenCell estimates savings of between $50-300 million over a 10-year period, depending on the price of ammonia versus diesel.

"We are now speaking with CFOs and the fact that it is green and is aligned with their sustainability goals is great but when you show them that it also saves money, that's the game changer. This is where you get their attention," said Reshef.

This is not a device that will see residential applications any time soon. Reshef says this market "will take time". Instead, GenCell expects owners of industrial facilities to be among the first adopters. He expects the fuel cell also to be deployed in hospitals, in disaster zones for use by first responders, educational centres, businesses, data centres and notably, telecoms. The company estimates there are 1.2 billion telecoms base station located at off-grid sites that are usually powered by diesel generators.

Reshef also believes the proliferation of battery-powered electric vehicles will be a big driver, as national grid owners struggle to provide enough charging points.

"EVs will represent 16-20 per cent of the car fleet by 2025. The question is how will the grid support the charging of these? The answer is: they cannot. It would cost trillions to extend the grid… so our idea is to have the ammonia tank driving a fuel cell to power these charging points at, say, a gas station or parking lot."

GenCell already has hydrogen fuel cells in operation around the world providing backup power for critical applications and it will not be long before this new ammonia-based unit hits the market. The first beta site has already been completed in Asia and there are plans for another installation in Africa in early 2019. The plan is to have a fully certified commercially available product by the second half of the year.

"Right now it's a working platform and is good enough to be placed at customer sites but we still need to complete the certification process," said Reshef.

GenCell says it already has several customers lined up from the communications sector, representing orders of "thousands of units". "We have signed a deal with a communications customer in Kenya," said Reshef. He added: "We are also working with utilities around the world."

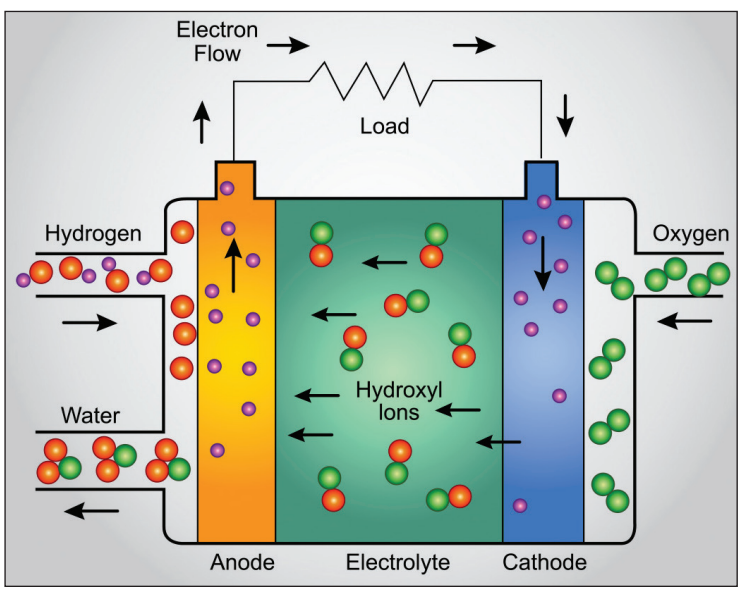
GenCell has already partnered with San Diego Electric in California to introduce GenCell technology to the utility arena in the US. While this is for its hydrogen-air G5 RX fuel cell, Reshef believes that such a partnership could help raise awareness of the potential of the ammonia-based unit in the sector.

Although utilities have not shown so much interest in the A5, Reshef says that utilities with customers in areas where the grid is not very stable "could and should" look into this technology as an alternative for what they are offering today in the form of diesel.

"Utilities that are responsible for distribution as well as generation have customers at the end of the grid; this is where there are usually fluctuations. They are already working with our hydrogen-air platform in order to review the critical points… in the future I could foresee them building a micro-grid at the end of the grid based on ammonia as a fuel – not only in developed countries but also in developing countries. This way, they could save a lot of money by avoiding having to build new [grid] infrastructure," said Reshef.

He summed up: "I really feel that eventually here's a solution where we can say it's time to say no to diesel. There's a viable alternative to stationary diesel [applications] and, in the future, diesel buses and trucks."

The alkaline fuel cell electrochemical process



Cost savings from 24x7x365 operation at 1000 towers over 10 years

Country	Ammonia price $/ton	Diesel price $/litre	Savings ($ million)
Italy	286	1.75	357
France	281	1.71	348
UK	291	1.71	345
Netherlands	273	1.54	304
Germany	267	1.46	283
South Korea	257	1.27	234
South Africa	271	1.16	200
Japan	306	1.1	174
China	228	1.01	170
Australia	303	1.06	164
India	333	1.02	146
Taiwan	269	0.81	105
USA: New England	237	0.78	105
USA: Mid Atlantic	243	0.78	103
USA: South	243	0.78	101
USA: West Coast	243	0.78	99
USA: Southwest	243	0.78	98

Junior Isles

Poles apart

The image of Michał Kurtyka, Poland's Secretary of State in the Ministry of Environment and COP24 President, leaping over the table in celebration at the conclusion of the UN's latest COP24 climate conference in Katowice is certainly a memorable one. But was there really much to jump up and down about?

Last month negotiators from 196 countries and the European Union worked for two weeks on the Katowice Climate Package, a deal aimed at putting the Paris Agreement into practice. At the summit's closing plenary session, Kurtyka said: "We have been working on this package for three years. When we have to deal with positions of almost 200 Parties, it is not easy to find an agreement concerning a multi-aspect and technical deal. Under these circumstances, each step forward was a great achievement."

In drawing up the Katowice Package, the world's climate change negotiators agreed on a set of rules in terms of the path that will be followed when it comes to stepping up actions for climate protection.

The Paris accord, which takes effect in 2020 and has no end date, allows countries to set their own emissions targets. The rules agreed in Katowice create a system for showing how the world is doing relative to the 2°C goal set in the Paris agreement.

At the summit, countries settled on most of the more difficult elements of the "rulebook", including how governments will measure, report on and verify their emissions-cutting efforts. This is a key element because it ensures all countries are held to proper standards and will make it harder for them to wriggle out of their commitments.

What was not agreed on, however, was the key question of how countries will step up their targets on cutting emissions. On current targets, the world is set for 3°C of warming compared to pre-industrial levels, which scientists say would be disastrous, resulting in droughts, floods, sea level rises and a fall in agricultural productivity. Some have already pointed to the forest fires in California and the increased frequency of hurricanes as evidence that climate change is already under way.

> Adopting a set of rules for climate action is not nearly enough when whole nations face extinction.

How to step up emission targets is in essence the key to having any chance of halting climate change. Without universal agreement on how this will be done, the world is at best left to hope that what individual countries and businesses decide to do on their own will be enough.

During the first week of the conference, a new report found that global carbon emissions are rising at their fastest pace in seven years and was set to hit an all-time high in 2018. The research conducted by the Global Carbon Project and the University of East Anglia (UEA) in the UK, estimates CO_2 emissions will rise by 2.7 per cent in 2018, sharply up on the plateau from 2014-16 and 1.6 per cent rise in 2017.

Professor Corinne Le Quéré, Director of the Tyndall Centre for Climate Change Research and Professor of Climate Change Science and Policy at UEA, said: "We are seeing a strong growth of global CO_2 emissions once again. Emissions need to peak and rapidly decrease to address climate change. With this year's growth in emissions, it looks like the peak is not yet in sight. This year we have seen how climate change can already amplify the impacts of heat waves worldwide. The California wildfires are just a snapshot of the growing impacts we face if we don't drive emissions down rapidly."

This report followed the UN Intergovernmental Panel on Climate Change (IPCC) report, which in October warned that there is only a dozen years for global warming to be kept to a maximum of 1.5°C.

According to the Mission 2020 campaign group, led by the former Executive Secretary of the UN Framework Convention on Climate Change, Christiana Figueres, global CO_2 emissions must start to fall from 2020 if we are to meet the temperature goals of the Paris agreement.

Figueres, who is also lead author of the Nature Commentary, believes "this is within our grasp". She said: "We have already achieved things that seemed unimaginable just a decade ago."

That may be so but the reality is, what has been achieved so far is nowhere near enough. Some environmental groups criticised the Katowice deal for failing to demand more urgent cuts to emissions. Jennifer Morgan, Director of Greenpeace International said: "A year of climate disasters and a dire warning from the world's top scientists should have led to so much more. Adopting a set of rules for climate action is not nearly enough when whole nations face extinction."

Morgan called this, "morally unacceptable". Yet such accusations are likely to fall on the deaf ears of some of the most polluting countries.

Talks in Poland were almost derailed on several occasions. Early on in the discussions four oil-producing nations – Kuwait, Russia, Saudi Arabia and the US – joined forces to scupper a motion that "welcomed" the October IPCC report. The US, which plans to withdraw from the Paris deal, also hosted a pro-fossil fuel event on the sidelines of the talks.

Poland also came in for harsh criticism. Mohamed Adow, Christian Aid's International Climate Lead, said: "This was a horribly run summit by the Poles who have now hogged the hosting rights three consecutive times it has come to Eastern Europe.

"Whether it was the perversity of using the meeting as a coal trade fair, harsh treatment of civil society members or a lack of interest in an ambitious outcome, it will not be remembered fondly. The EU should be ashamed of itself that a member country was allowed to twist a UN summit to its own agenda. It's vital that the world ensures the next time the meeting is held in Eastern Europe another country is chosen to preside over the talks."

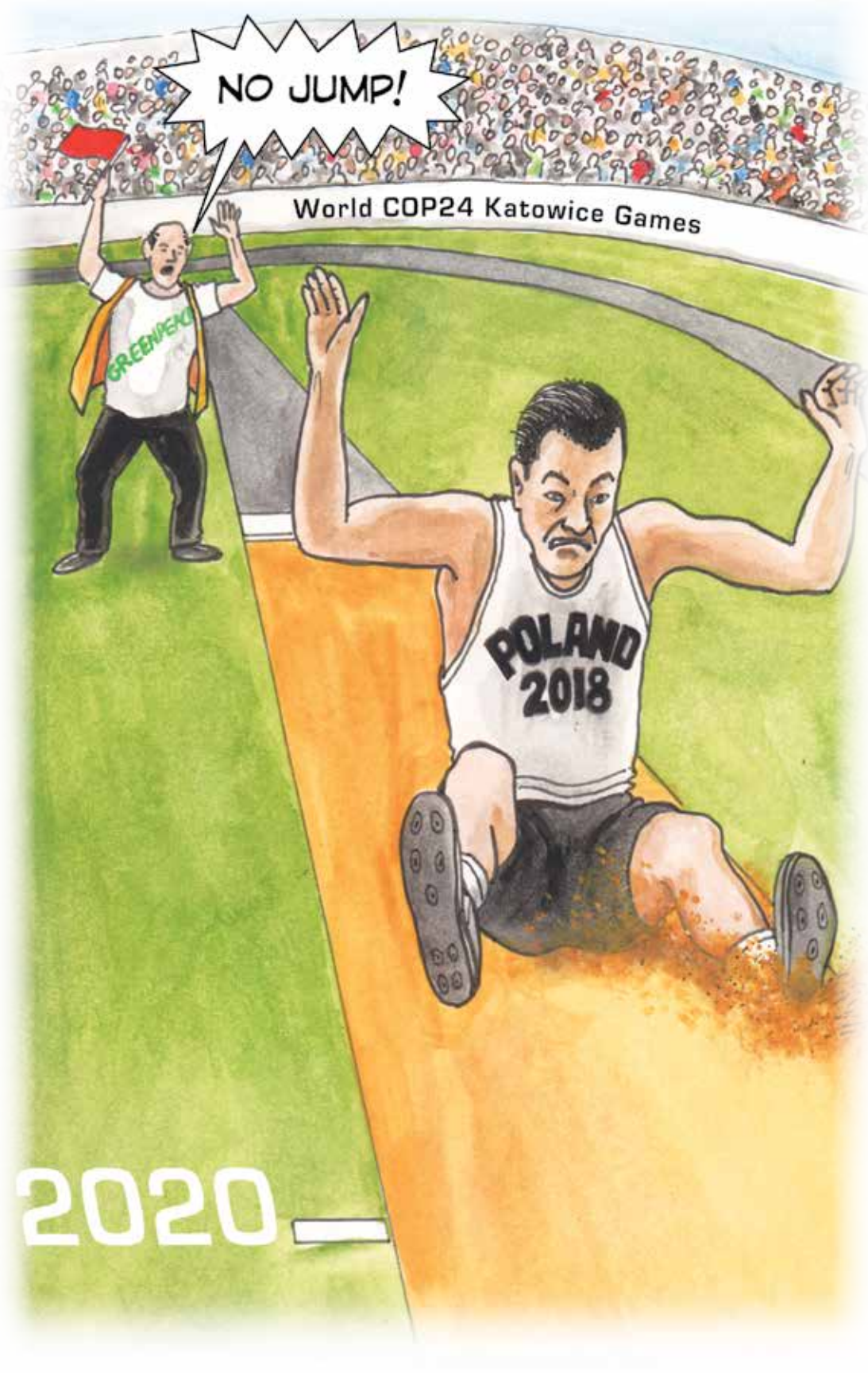
Whether one agrees with Adow or not, what there can be no disagreement over is the fact that time to close the emissions gap is fast running out. The Emissions Gap Report 2018 from the UN the "nationally determined commitments (NDCs)" made under the Paris agreement would be insufficient, even if implemented.

Instead, the report says, "current NDCs imply global warming of about 3°C by 2100, with warming continuing afterwards". Furthermore, it says the shift has to start now: if emissions do not turn down before 2030, it will be too late to stay below 2°C.

Indeed what was agreed in Katowice and what is needed are poles apart. Although the Katowice Package represents progress, it will do little to actually cut global CO_2 emissions. Countries agreed to submit data on emissions to the UN every two years starting in 2024, along with new climate targets every five years. This will make progress clear for all to see but it does not mean that progress will be sufficient. And in the meantime, the world keeps getting warmer.

The UN will meet again this year in Chile to thrash out the final elements of the Paris rulebook and begin work on future emissions targets. But the crunch conference will come in 2020, when countries must meet the deadline for their current emissions commitments and produce new targets for 2030 and beyond that go further towards meeting scientific advice.

There is much work to be done between now and the end of next year and meeting that deadline for the NDCs seems nigh on impossible. At worst, signatories to the accord will need to demonstrate the alacrity and energy that Kurtyka showed in his leap, even if that leap ultimately still falls short of what is required.



Cartoon: jemsoar.com