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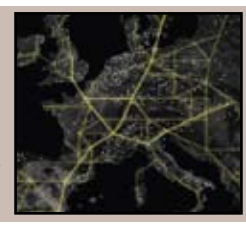

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"Historic" Paris Agreement marks start of climate change battle

French Foreign Minister Laurent Fabius called it "a historic turning point"

The signing of an international climate change agreement is a significant landmark in the transition to a low carbon economy but many see it as just the start in limiting global warming.

Junior Isles

Climate change negotiators signed what has been hailed as an "historic" agreement in Paris on December 12th. Many observers, however, are cautioning that this only marks the start of what will call for a tremendous global effort to limit a dangerous rise in global temperature levels.

After two weeks of intense negotiations world leaders, under the United Nations Framework Convention on Climate Change (UNFCCC), adopted an agreement to limit the rise in global temperature to less than 2°C above pre-industrial levels.

Among the key measures in the Paris Agreement, global leaders have agreed to:

- peak greenhouse gas emissions as soon as possible and achieve a balance between sources and sinks of greenhouse gases in the second half of this century
- keep global temperature increase "well below" 2°C, and to pursue efforts to limit it to 1.5°C
- review progress (upwards) every five years – a robust transparency and accountability system will track progress towards the long-term goal
- $100 billion each year in climate finance for developing countries by 2020, with a commitment to further finance in the future.

Following the adoption of the agreement, UNFCC Executive Secretary, Christiana Figueres declared: "The Paris Agreement confirms the irreversible transition to a low carbon, safer and healthier world."

Meanwhile, French Foreign Minister and President of the COP21 conference Laurent Fabius, praised the new deal as a "historical turning point" that could help the world to avoid catastrophic effects of climate change.

The agreement was broadly welcomed, although several observers noted that much hard work lies ahead.

Nick Molho, Executive Director of the Aldersgate Group said: "As was to be expected, the Paris summit has not delivered a deal that will immediately prevent warming of more than 2°C and there are still important issues that will need to be worked on in months to come. But it provides a very important step forward in international climate policy, by delivering an international political agreement to tackle climate change, which can be made more ambitious over time."

The agreement was also well received by environmental groups. WWF-UK Chief Executive David Nussbaum said: "For the first time, almost 200 countries have agreed on a landmark deal on climate change action for all. This Paris Agreement is a deal for both people and planet." He noted, however that "Paris is just the starting gun for the race towards a low-carbon future".

While the Paris Agreement would go into effect in 2020, scientists say that in order to meet the global goal of

Continued on Page 2

Clean energy transition in full swing

The transition to the low carbon world needed to underpin the recent Paris Agreement is gathering momentum.

New commitments registered in Paris saw the number of organisations that have made pledges for fossil fuel divestments pass the 500 mark. This represents over $3.4 trillion in assets.

The fossil fuel industry is facing a $33 trillion hit to its revenues over the next 20 years as a result of the COP21 global climate deal signed in Paris earlier in December, according to analysts at Barclays bank.

The move away from fossil to clean energy is also becoming a central strategy in the financial sector. A group of six green banks and two leading non-profit groups, including the Natural Resources Defense Council (NRDC), recently announced they are establishing a Green Bank Network to help meet the urgent need of increasing and accelerating investment in renewable energy and energy efficiency worldwide.

Renewable energy is forecast to provide the main investment opportunities in the coming years.

Presenting its 'Renewable Energy Medium-Term Market Report 2015' in London last month, the International Energy Agency said renewables account for about two thirds of new electricity generation to 2020.

Lead author of the report Mike Waldron told delegates: "Increasingly affordable renewables are set to dominate power additions and developing countries can now leapfrog to cleaner power systems."

This is already being seen in countries like India, which has a massive solar programme and is keen to accelerate the use of solar globally.

At the start of COP21 Indian Prime Minister Narendra Modi along with French President François Hollande launched the International Solar Alliance. At the same time, India announced that it will provide land and contribute about $30 million to build the Secretariat infrastructure of the initiative and support its operation for the next five years until 2021.

The alliance, including both developed and developing countries, aims to mobilise $1 trillion by 2030 to be invested in the generation of clean solar energy.

Solar was a big part of talks in Paris illustrated by several new government and business led initiatives. In addition to the International Solar Alliance, the Terrawatt Initiative and the Global Solar Council (GSC) were also launched.

The Terrawatt Initiative will work with interested partners to establish the right regulatory conditions to enable the addition of 1 TW solar capacity by 2030. The GSC, established by the leading regional and national solar associations, aims to unify the solar power sector at an international level, share best practices and accelerate global market developments.

COP21 also saw 38 countries and over 20 development and industry partners form a coalition known as the Global Geothermal Alliance. The initiative facilitated by the International Renewable Energy Agency (IRENA) aims to achieve a 500 per cent increase in global installed capacity for geothermal power generation and a 200 per cent increase in geothermal heating by 2030.

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limiting warming to 1.5°C or well below 2°C, emissions must peak before 2020 and sharply decline thereafter. The current pledges will provide about half of what is needed, leaving a 12 to 16 Gt emissions gap.

Tasneem Essop, head of the WWF delegation to the climate talks, noted: "The Paris Agreement is an important milestone. We made progress here, but the job is not done. This new agreement should be continuously strengthened and governments will need to go back home and deliver actions at all levels to close the emissions gap, resource the energy transition and protect the most vulnerable.

"The Paris talks also created a moment that produced announcements and commitments from governments, cities and business that signalled that the world is ready for a clean-energy transition."

Essop: governments need to deliver actions at all levels

Many observers point out that success depends on rapidly scaling up investments in cleaner technologies and infrastructure. The Paris Agreement is expected to unlock trillions of dollars in investments in the global low-carbon economy over the next two decades.

Writing in the *Financial Times*, eminent economist, Lord Nicholas Stern, said: "Governments must now respond to the Paris Agreement by unleashing the private sector, which will drive the acceleration now required to cut emissions and improve resilience to those impacts of climate change that cannot now be avoided."

He said hundreds of billions more than what has already been agreed could be made available if multilateral financial institutions "make better use of their balance sheets and their range of financial instruments" to strongly lever private sector flows.

"These institutions could be key drivers of an exciting economic transformation if they focus still more of their investments on projects to develop low-carbon energy systems, to rehabilitate degraded land and forests, and to construct clean and efficient cities," wrote Lord Stern.

Notably, the agreement also delivers a new mitigation crediting mechanism that can be seen as a successor of both the Clean Development Mechanism (CDM) and Joint Implementation (JI). Under the Paris Agreement, all parties – both developed and developing countries – are able to host the crediting mechanism and use credits generated towards their INDCs.

With a new crediting mechanism emerging, the CDM era will come to an end in 2020. Judith Schröter, Lead Analyst, US Carbon & Offset Markets at ICIS Tschach Solutions, noted: "Between now and 2020, we could see some degree of movement in terms of CDM activities, with the provision for the voluntary cancellation of CERs found in the Paris Agreement. However I would not hold my breath waiting for the resurgence of the CDM, such voluntary provision will only have a marginal impact at best."

Emissions monitoring is key to fulfilling Paris commitment

Accurate measurement and monitoring of emissions is central to ensuring countries fulfil their emission pledges and that the global climate agreement achieves its goal.

Junior Isles

While the agreement signed at COP21 has been broadly welcomed, monitoring and reporting on countries' efforts will be key to ensuring the agreement signed in Paris translates into successful outcomes.

At the UN climate summit last month, nearly 200 countries agreed that the rise in global temperature caused by greenhouse gases is to be kept "well below" 2°C, with aspirations to limit it to 1.5°C.

According to the National Physical Laboratory Centre for Carbon Measurement, agreeing a global, standardised and robust system of measurement, reporting and verification is "the only way" of ensuring the Intended Nationally Determined Contributions (INDCs) are fulfilled and the 2°C target met.

The issue was highlighted during the COP21 negotiations, with Bill Clinton's former scientific adviser stating: "If we don't have strong verification and monitoring, we don't have a strong agreement."

Marieke Beckmann, Research Lead, National Physical Laboratory Centre for Carbon Measurement commented: "Standard models of measurement use a bottom-up approach, estimating emissions based on activity data (e.g. electricity consumption in kWh) multiplied by an 'emission conversion factor' (e.g. the amount of carbon dioxide attributed to one kWh of electricity).

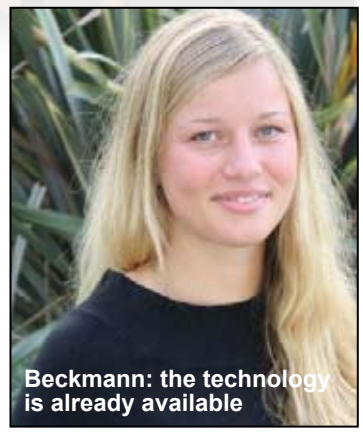
"In other words, it calculates greenhouse gas emissions based on activity performed. These factors are established using direct measurements, but differences in energy mixes between countries, not to mention emission uncertainties in some industries (e.g. agriculture), means we need to improve these to accurately assess if targets are met."

She notes that emissions measurement methods are already available that can achieve this.

"Differential Absorption LIDAR (DIAL) is a mobile facility that monitors concentration and distribution of atmospheric pollutants remotely at ranges of up to 3 km. Cavity Ring-down Spectroscopy (CRDS) measures continuous ambient emission concentrations with very high accuracy."

These ground-based methods, she says, can be partnered with climate monitoring satellites, giving accurate, global views of greenhouse gas levels.

"The technology is available to facilitate the clear, transparent monitoring of INDCs intended to limit our climate impact. What must follow is an agreed, unambiguous method for assessing greenhouse emissions and we need to support those countries with limited measurement capabilities, as outlined in the agreement. Without this there will always be room for disagreement and misreporting, something that our climate can ill-afford."



Beckmann: the technology is already available

■ The House of Lords EU Committee in England has published its report on EU energy governance and states that the EU-wide binding 2030 renewables target will not be delivered unless it is backed-up by a monitoring and enforcement mechanism that acts as a guarantor for the agreement, and ensures that Member States share the effort equitably. The report also calls on the UK government to do more to report on its own progress on energy and climate goals.

Businesses and cities lead climate change effort

Non-state actors are predicted to take the leading role in combatting climate change.

The President of the European Committee of the Regions (CoR), Markku Markkula, and the European Commission's Vice-President, Maroš Sefčovič, have said that cities and regions are key partners in efforts to limit the rise in the Earth's temperature below 2°C.

During last month's UN COP21 climate change summit in Paris, they called on local and regional governments across the world to join forces by signing up to the Covenant of Mayors (CoM), which commits signatories to cutting at least 40 per cent of 1990 levels of carbon emissions by 2030.

Referring to a UNFCCC report that suggests current climate proposals would not limit temperature rises to 2°C, Markkula, said: "The current climate proposals lack teeth and won't be enough... The Covenant of Mayors is a perfect example of successful multi-level governance in climate policy: it delivers results and surpasses national ambition."

Launched in 2008, the Covenant of Mayors commits local and regional governments to meet and exceed the EU's climate and energy targets. Since then it has grown with over 6500 cities and regions representing over 200 million citizens agreeing to cut more than 20 per cent of their carbon emissions by 2020.

Building on the momentum, it was recently merged with the Mayors Adapt – which supports cities and regions to integrate mitigation and adaptation measures – and set a new 40 per cent carbon-reduction emission target for 2030.

At the local level businesses are also expected to have a key role in cutting emissions.

During COP21 the global collaborative business initiative RE100 passed a milestone as BMW Group, Coca-Cola Enterprises, International Flavors & Fragrances Inc. (IFF), Nordea Bank AB, Pearson PLC and Swiss Post announced they will source 100 per cent of their electricity from renewable energy – taking the total number of committed companies to 53.

It is estimated that when this group of 53 companies are 100 per cent powered by renewables, they will create demand for 90.1 TWh of renewable electricity – around 0.4 per cent of global electricity or 1 per cent of electricity used by industry.

The Climate Group and CDP also estimate that if 1000 of the world's most influential companies became 100 per cent powered by renewable electricity, they could save around 1080 Mt of CO_2 every year – 3.4 per cent of total global emissions, i.e. more than all of Africa. According to IEA estimates, these 1000 companies account for 8.1 per cent of global industrial electricity demand.

Separately, business leaders including Bill Gates, Sir Richard Branson and Mark Zuckerberg launched a new global clean energy research project. During COP21, the founders of Microsoft, Virgin Group and Facebook announced the Breakthrough Energy Coalition, a new initiative that includes 28 investors from more than 10 countries.

The initiative will research and develop artificial photosynthesis, using sunlight to produce liquid hydrocarbons that could replace fossil fuels, according to Gates.

Clash over European energy security

Proposals for a new gas pipeline from Russia to Europe is causing conflict among EU ministers.

The plan to build the Nord Stream 2 pipeline, supported by Germany and Russia, came under renewed and heightened criticism in December at a summit of European Union leaders in Brussels.

Nord Stream 2 would build on the existing Nord Stream pipeline, a conduit that delivers Russian natural gas to Germany via the Baltic Sea. Crucially, the pipeline cuts out Ukraine, a key strategic objective for Russia since the original project's inception.

The latest $11 billion expansion would double the pipeline's current capacity of 55 billion m^3 of gas per year. From Russia's point of view, the project will increase market share and gas sales; for Germany, the project increases sources of supply.

Seven European countries sent a letter to the European Commission in November, outlining their concern over the pipeline. They say the expansion will increase dependence on Russia at a time when the EU has pledged to do the opposite.

Others argue that the expansion will drastically cut gas flows through Ukraine, which could in turn undermine the economy by taking away the lucrative transfer fees that Kiev receives.

The US has also voiced its opposition. "All I see is an overarching political agenda to get rid of Ukraine as a transit country at all cost, no matter what the financial cost is," Amos Hochstein, the US special envoy for international energy affairs, told the *Wall Street Journal*.

On December 18 at the summit in Brussels, Donald Tusk, European Council President and former Prime Minister of Poland, commented: "In my perspective, Nord Stream does not help diversification, nor would it reduce our energy dependence."

Germany continues to defend its position. German Chancellor Angela Merkel, says the project is about economics, not politics. "I have made it clear, along with others, that this is first of all an economic project. There are private investors for this project."

Germany's Economy Minister Sigmar Gabriel insists that if the project moves forward, it will comply with EU law. Gabriel had previously vowed to prevent "political meddling" from bogging down the project.

US solar, wind sectors celebrate tax credit extension

Congress' approval of a bill extending tax credits for wind and solar will provide a major boost for renewable energy developers in the USA.

Siân Crampsie

Renewable energy industry leaders have praised US lawmakers for agreeing to extend tax credits for solar and wind energy projects for another five years.

In a surprise move, Congress voted to approve the multi-year extension of the production tax credit (PTC) for wind energy and the investment tax credit (ITC) for solar projects.

The deal is not only expected to boost confidence in renewable energy investment in the USA, but will also end the boom-bust cycles that the wind and solar sectors have typically experienced and enable supply chain development.

The American Wind Energy Association (AWEA) said that the deal would enable the wind sector to keep its "success story going". The wind energy PTC expired at the end of 2014 and the extension will be retroactively applied from the start of 2015.

The 30 per cent solar tax credit was set to expire in 2016 and will now extend through 2019 before tapering to 10 per cent in 2022.

"With predictable policies now in place, we will continue advancing wind turbine technology, driving down our costs and passing the savings on to American families and businesses in all corners of the country," said Tom Kiernan, CEO of AWEA.

Pattern Energy CEO Mike Garland said that Pattern would expand its project development for the coming year because of the PTC extension, while Siemens Onshore Americas said that the move would allow factories to "plan for the future".

The agreement is part of a $1.1 trillion government spending bill and a $650 million tax breaks package. "A five-year extension of the ITC will lead to more than $133 billion in new, private sector investment in the US economy by 2020," said Rhone Resch, President and CEO of the Solar Energy Industries Association (SEIA). "Solar power in this nation will more than triple by 2020, hitting 100 GW. That's enough to power 20 million homes and represents 3.5 per cent of US electricity generation."

According to Bloomberg New Energy Finance (BNEF), the extension will add an extra 20 GW of solar power and 19 GW of wind energy to the US grid. Combined, the extensions will spur more than $73 million of investment and will help these two renewable energy technologies achieve parity with the cheap natural gas and coal plants operating in parts of the USA.

By the time the new tax credit expires, solar and wind will be the cheapest forms of new electricity in many states across the US, BNEF said.

"The solar industry now has a seat at the table with the nation's other major electricity producers," said Resch.

Brazil boosts ties with India and China

Vieira wants to "get down to specifics" on collaborative research

Brazil is seeking support from other nations in the development of its electricity sector.

Brazilian Minister of Foreign Affairs Mauro Vieira said in November that the country is keen to cooperate with India in the field of nuclear energy, while President Dilma Rousseff said on the sidelines of the Paris Climate talks that it would also increase cooperation with China in a number of areas including global warming.

In an interview with *The Hindu*, Vieira said: "We are very interested to get a share of India's expertise in nuclear energy and nuclear technology. We want to get down to the specifics on collaborative research, development and scientific exchanges in the field of nuclear energy production with India."

Brazil has two nuclear reactors that generate around three per cent of its electricity, and a third under construction. Further projects have been suggested but it is unlikely that construction of any new plant would commence until after 2020.

Chinese President Xi Jinping said in Paris that China was keen to deepen the strategic partnership between the two countries and expand industrial investment cooperation in the fields of energy and resources, agriculture, infrastructure and manufacturing.

China and Brazil could also boost bilateral trade, enhance financial cooperation, and make effective use of the BRICS New Development Bank as well as a package of financing arrangements between China and Latin America so as to provide financial support for promoting China-Brazil trade and investment, Xi said.

■ Engie has won bids to develop 230 MW of solar energy capacity in Brazil in a tender organised by Aneel. Its subsidiaries Tractebel Energia and Solairedirect will develop 30 MW and 200 MW respectively, in Rio Grande do Norte and Minas Gerais, with production starting in late 2018.

NY to develop new clean energy standard

New York Governor Andrew Cuomo has pledged to enact a new Clean Energy Standard mandating that half of all electricity consumed in New York state by 2030 is sourced from clean and renewable energy.

Cuomo has directed the State Department of Public Service to design and enact the new Clean Energy Standard as part of his 'Reforming the Energy Vision' (REV) project, which is expected to reduce costs for renewable energy and create new opportunities for large scale renewable energy projects.

The standard will play a significant role in the state's previously announced plan to reduce carbon emissions by 40 per cent from 1990 levels. A proposal for the new standard is expected to be presented to the Public Service Commission by June 2016.

"Climate change is one of the defining issues of our time, and we must act now," said Cuomo. "With one of the most aggressive renewable energy goals of any state in the nation, we are leading by example to ensure the possibility of a bright future for generations to come."

In November 2015, Cuomo vetoed the Port Ambrose Liquefied Natural Gas Deepwater Port project because of concerns that it could negatively impact offshore wind development.

Latin America set for strong renewables growth

- Mexico, Argentina, Brazil key markets
- Mexico completes energy reform

Strong policy frameworks and targets for clean energy growth are driving increased investment in renewable energy in Latin America.

A new report from analysts GlobalData indicates that Brazil, Mexico and Argentina are particularly key markets for renewable energy growth in the region, helped by a commitment to reducing emissions and limiting the use of fossil fuels.

According to GlobalData, initiatives such as Brazil's auction procedures are boosting the adoption of renewable energy sources. Such strategies contribute towards the country's overall aims to reduce greenhouse gas emissions from deforestation and achieve a national emission reduction of 36.1–38.9 per cent by 2020, compared with levels in 2000.

Over 25 per cent of Brazil's total power capacity is forecast to come from non-hydro renewable sources by 2025.

Harshavardhan Reddy Nagatham, GlobalData Analyst, said Mexico also appears to be making positive moves towards limiting the environmental impact of its energy consumption.

Nagatham explains: "The Mexican government is currently aiming to limit the generation share accounted for by fossil fuel technologies to 65 per cent in 2024, 60 per cent in 2035, and 50 per cent in 2050, leaving a space for renewable power to be adopted widely.

"Mexico contains substantial amounts of coal, oil and gas, which currently dominate the country's energy mix, so the Mexican government's move towards limiting the use of fossil fuels is indicative of a commitment to fighting climate change."

Last month Mexico's senate approved the Energy Transition Law (ETL), completing the country's energy reform process and establishing goals and mechanisms for incorporating renewables into the electric grid.

ETL mandates goals of obtaining 35 per cent clean energy in the electricity mix by 2024. It also sets a target of 25 per cent by 2018 and 30 per cent by 2021, as well as creating an annual process for reviewing clean energy growth.

In Argentina, a target for 8 per cent of power consumption to be sourced from renewable energy by 2016 has been set, and a large number of projects are receiving government funding, said GlobalData.

■ Gamesa and Mexico's CFE have signed a deal on the co-development of wind energy projects in Mexico. The two companies will search for ways to encourage technological, industrial and supply chain development in the sector in Mexico and to champion research, development and innovation in the renewable energy field. The deal also includes the possibility of CFE studying opportunities for participating in wind projects in which Gamesa has a stake in other Latin American markets and the US.

China continues Australian investment

- Deal signed for hydro and wind assets
- Hareon Solar considers billion dollar investment

Junior Isles

China is continuing its expansion in Australia with the recent acquisition of several assets in the country's power sector.

In the latest of a string of Sino-Australian infrastructure deals, China's State Power Investment Corporation has agreed to buy Pacific Hydro, a renewable energy business.

In December IFM Investors, one of Australia's largest pension funds, said it signed a deal with State Power to sell the portfolio of 19 hydroelectric and wind farms in Australia, Chile and Brazil. Local media estimated the deal at more than A$2 billion ($1.45 billion).

State Power Investment (SPI) Corp is the result of a merger in August between China Power Investment (CPI) – one of China's 'big five' power generation investors – and State Nuclear Power Technology Corp, which was originally set up to develop a Chinese-designed nuclear reactor following a technology transfer from Westinghouse.

SPI's success follows the unsuccessful bid by State Grid of China for TransGrid, one of Australia's biggest electricity networks. That asset was acquired by a consortium led by Hastings Funds Management and backed by Middle Eastern and Canadian investors. The Hastings consortium bought Transgrid for A$10.3 billion ($7.5 billion) amid concerns over a surge in Chinese investment.

According to KPMG, China has invested about A$70 billion in the last seven years. A report by KPMG and Sydney University – Demystifying Chinese Investment in Australia – found a notable shift away from investing in mining towards a focus on infrastructure, real estate and agriculture.

China leapfrogged the US to become the largest foreign investor in Australia in 2013-14, with its companies receiving Foreign Investment Review Board (FIRB) approval for projects worth A$27 billion.

The renewables sector continues to provide opportunities. In early December Chinese firm Hareon Solar said it is "actively" considering a billion dollar investment in large-scale solar projects in Australia. The company said, however that the stability of government climate policy is its major concern.

Jie Zhang, Hareon's vice president of global business development told *Guardian Australia*: "Our only wish for government is a stable policy, don't flip back and forth, of course we are concerned what has happened in the past in Australia with the renewable energy target," he said in an interview at the Paris climate summit.

A recent announcement by the Australian government, however, indicates the country may be willing to increase its commitment to renewables. The country's new Prime Minister Malcolm Turnbull made a U-turn on the energy policy with the announcement that the Australian federal government will include wind power in the new investment mandate of the Clean Energy Finance Corporation (CEFC), with a special focus on offshore wind energy. Turnbull's predecessor, Tony Abbott, had banned investment in new wind power projects.

There was further evidence of the country's growing interest in renewables, with South Australia revealing details of its plan to achieve $10 billion in investment in low-carbon generation by 2025.

The plan, launched by Premier Jay Weatherill, sets out four key strategies to meet the investment target as well as its renewable energy target of 50 per cent by 2025 – both key pathways to the government's goal of establishing Adelaide as the world's first carbon neutral city.

Pakistan coal projects move forward

Syed Ali

Coal fired projects, crucial to boosting power-starved Pakistan, are moving forward.

China and Pakistan signed a financing agreement on a coal power project located in the Thar coalfield in Pakistan's Sindh province.

The project will cost in excess of $2 billion, including the exploitation of a 3.8 million tonnes per year coal mine and the construction of a 660 MW power station near the mine.

China will contribute $800 million to the financing, while the Pakistani partners will provide $500 million, mainly through China Development Bank and Habib Bank. The project is expected to be completed by the end of 2017, and it will be the first such project in the China-Pakistan Economic Corridor (CPEC).

Earlier, in October, the Chinese government had agreed to increase the financing of the Thar coal project in a move to double the generation capacity of Thar Block-II from 660 to 1320 MW and increase the mine size from 3.8 to 6.5 million tonnes per annum as part of the priority list of CPEC projects.

Coal remains central to Pakistan's plans to boost power capacity and the sector is attracting significant private investment.

Just before the announcement of financing for Thar, a $5 billion joint venture agreement was signed between Metal Investment Holding Corporation, UAE, and Power China E and M International, China. The agreement will see the companies undertake 3x1320 MW (3960 MW) coal fired power plants at Port Qasim, Karachi.

Haji Amin Pardesi, Chairman Metal Investment Holding Corporation, UAE, said the independent power producer (IPP) project was the single largest foreign direct investment ever to come to Pakistan.

Pakistan's coal sector is attracting private investment

Nuclear could be part of Malaysia's GHG reduction strategy

Malaysian Prime Minister Najib Razak says that his country intends to cut its greenhouse gas emissions by 45 per cent by 2030 relative to 2005 levels.

His remarks came as world leaders gathered in Paris to hammer out a deal on climate change.

Commenting on the 45 per cent reduction, he said: "This consists of 35 per cent on an unconditional basis and a further 10 per cent is condition upon receipt of climate finance, technology transfer and capacity building from developed countries."

Nuclear power has not been ruled out as potentially being part of the strategy to reduce CO_2. Plans for nuclear power have been included under the 11th Malaysia Plan to generate public awareness on the nation's future energy requirements.

Last month Datuk Mah Siew Keong, a minister in the Prime Minister's Department, said that until now the government has not concluded any decision on this matter, as the feasibility studies were still being carried out.

Keong said: "The decision will be based on findings of the Malaysian Nuclear Power Corporation and include the views of the rakyat [ordinary people]."

Malaysia is mulling plans to build two 1000 MW reactors under its Economic Transformation Programme.

According to the minister, the government has not finalised a detailed timeframe for the actual construction of the nuclear power plants. "The earliest (date) for the nuclear power plants to be operational is by 2030," Keong said.

In the Economic Transformation Programme's report in 2010, it was estimated that Malaysia could spend about RM21.3 billion ($5.4 billion) for a 2000 MW nuclear power plant.

- China General Nuclear Power Group (CGN) has clinched a deal to buy the power assets of 1MDB for $2.3 billion. The deal is part of a broader overseas expansion by CGN.

Indonesia chooses geothermal over nuclear

- Nuclear not an option until 2050
- Geothermal to hit 7 GW by 2025

Syed Ali

Indonesia has cancelled a previous $8 billion plan to operate four nuclear plants with a total capacity of 6 GW by 2025.

The country says that "this is not the time" to build up nuclear power capacity. "We still have many alternatives and we do not need to raise any controversies," said Energy and Mineral Resources Minister Sudirman Said.

The minister added that Indonesia will continue to follow developments in the field of nuclear technology and that it would remain a "last-resort option" for possible use beyond 2050.

The minister spoke after the National Energy Council, a presidential advisory body, completed its latest National Energy Plan, which is to be signed by President Joko Widodo to become a presidential regulation.

The plan, last revised in 2006, lays down the ground rules and guidelines for energy development in Indonesia, as well as the country's commitment to reduce greenhouse gas emissions.

The plan from 2006 still left room for nuclear energy, but the latest guidelines say Indonesia should increase the use of renewable energy sources to 23 per cent of its total primary energy – from the current target of 5 per cent – by 2025.

In line with these guidelines, geothermal power producer PT Pertamina Geothermal Energy (PGE), a unit of state-owned PT Pertamina, announced that it will invest some $2.5 billion to develop seven geothermal projects, that may be commissioned by 2019.

By 2025, PGE targets a total geothermal capacity of 7094.5 MW, from 437 MW at present.

PGE President Director Irfan Zainuddin said, the company has set aside $644 million for capital expenditure in 2016.

UK fine-tunes subsidy cuts

Deployment of small-scale renewable projects will continue but caps and digressions will limit industry growth.

Siân Crampsie

The renewable energy sector in the UK says growth of small-scale projects will be constrained following a far-reaching government review into subsidies for solar, wind, hydro and anaerobic digestion (AD).

The government has published revised subsidy levels for renewable energy projects, which it says will help it to control the impact of renewable energy deployment on bill payers.

Its measures include reduced feed-in tariff (FIT) rates across the board, new deployment caps to control spending, and the closure of the renewables obligation (RO) scheme for solar photovoltaic projects of 5 MW and below.

Although cuts to renewable energy subsidies will not be as severe as the industry feared, clean energy firms and developers have expressed dismay at the measures being taken, particularly in light of the recent climate deal in Paris.

"The government has pulled back from the worst of its proposals to cut support for renewable energy following a strong reaction from communities and businesses," said Regen SW CEO Merlin Hyman. "However, the strict caps to support for renewables are in painful contrast to the ambitions set out in Paris."

The government launched its review in August, initially proposing radical cuts to FITs of up to 87 per cent. In its latest announcement it said that it would re-introduce pre-accreditation for solar PV and wind generators over 50 kW and all hydro and anaerobic digestion generators, as well as a RO 'grace period' to protect solar PV developers who made a significant financial commitment to a project on or before 22 July 2015.

Greenpeace said that the government had "swapped a blunt axe for a sharp scalpel" but was "still cutting in the wrong places". Mongoose Energy CEO Jan-Willem Bode suggested that the industry had been duped: "By preparing us for the worst possible scenario and then climbing down slightly, it feels like they're trying to make bad news look good."

The Solar Trade Association (STA) said that it would continue to lobby for a better deal. "Allocating only around 1 per cent of its clean power budget to new solar is too little, particularly when solar is now so cost-effective," said Paul Barwell, STA CEO. "Poor ambition for solar risks missing out on not only our renewable energy targets in the UK, but on the world's greatest economic opportunity too."

In the solar sector, domestic tariffs will be cut by 64 per cent to 4.39 p/kWh, compared to 12 p/kWh today and the cut of up to 87 per cent to 1.63 p/kWh proposed by the government in August. The new tariffs will come into force from February 8, 2016, and the deadline for projects to receive the current higher tariffs is now January 15.

Crucially, the government has confirmed its decision to end 'grandfathering', the principle of guaranteeing projects a fixed subsidy rate for their entire lifetime.

"Removing the grandfathering guarantee makes no sense for solar – it's the thin end of the wedge," said Barwell. "You cannot have the level of support changing over the lifetime of a project as investors won't take the risk."

RenewableUK said that it was concerned about the use of deployment caps and the pace of digression rates, but welcomed the concessions made by the government after an intense industry-wide campaign objecting to the cuts.

"We welcome the fact that the government has heeded our requests on certain specific issues, such as re-introducing pre-accreditation for medium-scale wind projects – this means that developers will have confidence to invest and deliver cost savings," said Maria McCaffery, RenewableUK CEO. "We are also pleased to see that our request for the introduction of a specific level of financial support for smaller turbines (50-100 kW) has been accepted by Ministers."

The government has been widely criticised for cutting spending on renewables while moving forward with plans for nuclear energy and fracking, however. In November the UK's Committee on Climate Change (CCC) said that while the UK has made good progress in reducing emissions to date, new policies and clear long-term investor signals would be needed to keep the country within emissions limits set for 2050. It reported that by the 2030s, the UK should be "largely powered" by low-carbon sources of electricity.

Posiva given all clear for nuclear repository

The new waste facility will take fuel from Olkiluoto 3

Finland's government has become the first in the world to grant a license for the construction of a final disposal facility for spent nuclear fuel.

Posiva will take on the construction of the facility, which will be located at Olkiluoto and take used fuel from the Olkiluoto and Loviisa nuclear power plants. The firm said it had worked for more than 40 years on the research and development of a final disposal solution.

The disposal facility will be a deep geological repository in which fuel will be stored without first undergoing reprocessing. The project will proceed in stages in order to maximise safety and collect data on aspects of such as the stability of the strata.

"The construction licence that has now been granted for our final disposal facility for spent nuclear fuel is a significant achievement for us, our owners and our entire personnel," said Posiva President and CEO Janne Mokka. "This pioneering project is important not only for Finland, but also on a global scale. It is the first project entering into construction phase in the whole world."

Posiva was established by Finland's nuclear power industry and has studied the geological and groundwater conditions extensively. It believes that the bedrock has been stable for more than 1 billion years.

Construction will start at the end of 2016, with the aim of starting operations in 2023.

- Neste, Veolia and Borealis have agreed to create a joint venture company to build a new combined heat and power plant in Porvoo, Finland. The 450 MWth, 30 MWe facility will provide steam and other utilities to Neste's refinery and Borealis' petrochemical plants in Porvoo. Operation is expected to start in 2018.

UK awards fracking licenses

- Sensitive sites can be fracked
- Major programme of exploration to get under way

Fourteen companies have been awarded licenses to frack in England in an attempt by the UK government to kick-start the shale gas industry.

The UK Oil and Gas Authority (OGA) awarded fracking licenses for exploration in 124 different areas and industry experts believe that first shale gas production could start by the end of the decade.

In a controversial move, lawmakers in the UK also voted last month to allow fracking to take place under National Parks and other protected rural areas.

OGA said that the license round "attracted strong interest and a high quality of proposed work programmes" that would enable "a significant amount of the UK's shale prospects to be taken forward to be explored and tested".

The UK is the only European country to be pushing forward with shale gas exploration. Concerns over the environmental impact of the fracking process has led other governments to shy away from developing the industry.

UK Energy Minister Andrea Leadstrom said that the licenses would drive the industry forward to "provide secure, home grown energy".

Greenpeace said that the move would mean that "previously protected areas could be ringed by drilling rigs, floodlights and compressors – and play host to thousands of lorry movements – meaning the most precious landscapes in our country are blighted by noise, air and light pollution".

The Shale Gas Task Force said that exploratory drilling by the new license holders would help the industry to get a clearer picture of the UK's shale resources. It said in a new report that because of the UK's high regulatory and industry standards, there is no more risk to the public from fracking than other comparable industries.

"The size of the UK industry's impact will depend on its (as yet unknown) potential output," said Lord Chris Smith, chair of the Task Force on Shale Gas. "We recommend that a number of exploratory wells should be allowed to go ahead, under the very strict environmental safeguards that we have outlined in our previous reports, in order to establish a much clearer picture of where and how much recoverable gas there is in the UK.

"Only when we have a better understanding of how much gas could be recovered in the UK will the public be able to make an informed decision as to whether they support it."

The Task Force is convinced that gas has a role to play as an interim energy source over the short and medium term.

Egypt signs agreements for power sector growth

Renewable energy, gas and nuclear energy will all play a role in Egypt's future power supplies thanks to recent agreements signed by the government.

Siân Crampsie

Egypt is laying the foundations for continued investment in its power sector, where annual demand growth is averaging seven per cent.

The country has signed a draft agreement with Russia covering the construction of four nuclear reactors, and has also sealed agreements covering its solar power sector and the construction of a new gas-fired power plant at Damanhour.

Russia has agreed to provide Egypt with a $25 billion credit line to cover 85 per cent of the cost of the construction of Egypt's first nuclear power plant. The project will play a key role in helping the country to boost power generating capacity and will comprise four 1200 MW reactors constructed in Dabaa, 130 km south of Cairo.

The nuclear plant will be the largest joint project between Russia and Egypt since the Aswan Dam was constructed, according to the head of Rosatom, Sergey Kirienko. Russia will provide the loan in instalments between 2016 and 2018. Egypt will have to repay it over a 22-year period, with the first repayment scheduled for 2029, at an annual interest rate of three per cent.

Last month Egypt signed a $600 million loan agreement with the European Investment Bank (EIB) to finance the 1800 MW Damanhour combined cycle gas turbine plant.

The $1.3 billion project will be built in the Nile Delta area of Egypt, 5 km northwest of Damanhour town, and is also supported by finance from the European Bank for Reconstruction and Development (EBRD) and the Arab Fund for Economic and Social Development.

"Developing energy infrastructure is key to promoting growth and employment," stated Román Escolano, EIB Vice President. He added: "The Damanhour power plant project is a critical investment and a strategic choice for the country as it will contribute to increasing the electricity supply at competitive cost using modern technology with a low environmental impact."

The EIB loan follows an agreement between Egypt and the EBRD for finance to support Egypt's new solar energy programme.

Egypt has set a target of generating 20 per cent of its electricity from renewable energy sources by 2020. It is procuring large-scale projects through international tenders and has established a feed-in tariff scheme to support the development of 4300 MW of wind and solar energy over two years.

In 2015, Egypt attracted a bid of 4 ¢/kWh for a 250 MW wind farm in the Gulf of Suez – one of the lowest wind prices seen anywhere in the world.

In November, Egypt officially opened a 200 MW wind farm – the largest in Africa – in the Gulf of El Zeit. The facility will increase Egypt's wind energy capacity by 35 per cent.

Financial firms strengthen carbon risk policies

Major banking and finance firms are increasing finance for clean energy projects and reinforcing their carbon risk policies to limit their exposure to fossil fuel industry activities.

France's BNP Paribas says that it will more than double the financing resources allocated to the renewable energy sector by 2020, while Allianz said in November that it would stop financing coal-based businesses.

BNP Paribas is aiming to increase renewable energy finance from €6.9 billion in 2014 to €15 billion in 2020. It will also continue to promote green bonds to institutional investors and is aiming to become a global top-three player for euro-denominated issues by 2018.

"Our decision to more than double our financing in the renewable energy sector and to reinforce our carbon risk management procedures is both an environmental and economic necessity," Jean-Laurent Bonnafé, CEO of BNP Paribas, said.

Allianz Chief Investment Officer Andreas Gruber told German journalists that it will no longer invest in companies that derive more than 30 per cent of revenue from coal mining or generate over 30 per cent of their energy from coal.

Gruber said that the firm will make the changes in the next six months, and double investments in wind energy projects to around €4 billion.

The bank has decided that it will no longer finance coal mining activities, whether through direct financing of mining projects or by financing mining companies specialising in coal extraction, unless they have put in place an energy diversification strategy.

The bank will provide no further financing for coal-fired power plants in high-income countries. Elsewhere, BNP Paribas will consider the possibility to finance such projects provided that the host country has made a commitment to limit greenhouse gases emissions as part of the COP21 framework.

BNP Paribas also said it will only provide financing to power generation companies that have a formal strategy to reduce the share of coal in their power generation mix.

BNP Paribas is also going to include a climate component in its methodology for rating companies and projects financed by the bank. This means that going forward the bank will progressively integrate the use of an internal carbon price in its financing decisions, to reflect the changes brought about by the transition towards sustainable energy and to take into account the associated risks.

"We're determined to live up to our role as a responsible bank by supporting companies and countries that are committed to the transition to sustainable energy use. This is a high priority in which technological innovation will help to drive progress. For this reason, we have also made a commitment to invest €100 million by 2020 in start-ups working to develop solutions in areas such as energy storage and smart grids," said Bonnafé.

UAE pushes solar developments

- DEWA examines 800 MW bids
- ADWEA, FEWA launch solar bids

Dubai and Abu Dhabi are moving forward with plans to expand the use of solar energy.

The government of Abu Dhabi announced last month plans to build a new 350 MW solar power facility, while Dubai's DEWA said that it has examined the bids made for the third phase of the Mohammed bin Rashid Al Maktoum solar park.

In Abu Dhabi, the government said that ADWEA would select a developer for the solar park project by mid-2016. The project would be the utility's first solar farm.

According to DEWA, just 18 companies remain in the bidding for the prequalification round for the 800 MW Mohammed bin Rashid Al Maktoum phase 3 project. Some 95 companies expressed an interest in the project.

The solar park was slated to achieve and installed capacity of 3000 MW by 2030, but the Dubai government announced in late November 2015 that it would increase it to 5000 MW.

Dubai expects 25 per cent of its power generation from solar energy in just 15 years. In November 2015 it launched its Clean Energy Strategy 2050, which aims to increase the share of green energy in the emirate to 75 per cent.

The strategy will cost around $13 billion to implement, according to reports, but reflects its "commitment in establishing a sustainable model in energy conservation and supporting economic growth without damaging the environment and natural sources", Sheikh Mohammed Bin Rashid Al-Maktoum, the United Arab Emirates (UAE) Vice President and Emir of Dubai, said.

In addition to Abu Dhabi, other emirates have followed Dubai's lead. Last year the Federal Electricity and Water Authority (FEWA) – which covers five emirates in the UAE: Sharjah, Ajman, Umm Al Qaiwain, Ras Al Khaimah, and Fujairah – announced plans to build a 100 MW solar power project.

African nations launch ambitious renewable energy initiative

African governments have launched an ambitious plan to install 300 GW of renewable energy capacity on the continent by 2030.

The African Renewable Energy Initiative (AREI) was launched at the Paris climate talks last month and aims to deliver 10 GW by 2020 and was described as a "game-changer" for development in Africa.

A key objective of the initiative is accelerating access to energy, reducing energy poverty and mobilizing finance from private investors, multilateral development banks and development finance institutions.

"To put it in context Africa's current total energy output is 150 GW," said Mohamed Adow, Christian Aid Senior Climate Advisor. "This would deliver double that amount and all of it clean and renewable. It's a major contribution towards meeting Africa's energy needs; it will both ensure energy access for the poor and cut climate pollution. These are meaningful and practical benefits for everyone.

"This is an exceptional moment in Africa's history, I am proud to see Africa, despite its current low emissions, lead the world in realising these easily available and under-utilised natural resources. Increased access to renewable energy will drastically increase the wellbeing of energy-poor Africans.

"What we now need is for world leaders to support this effort and get behind Africa's renewable energy revolution."

Statkraft stops offshore wind spend

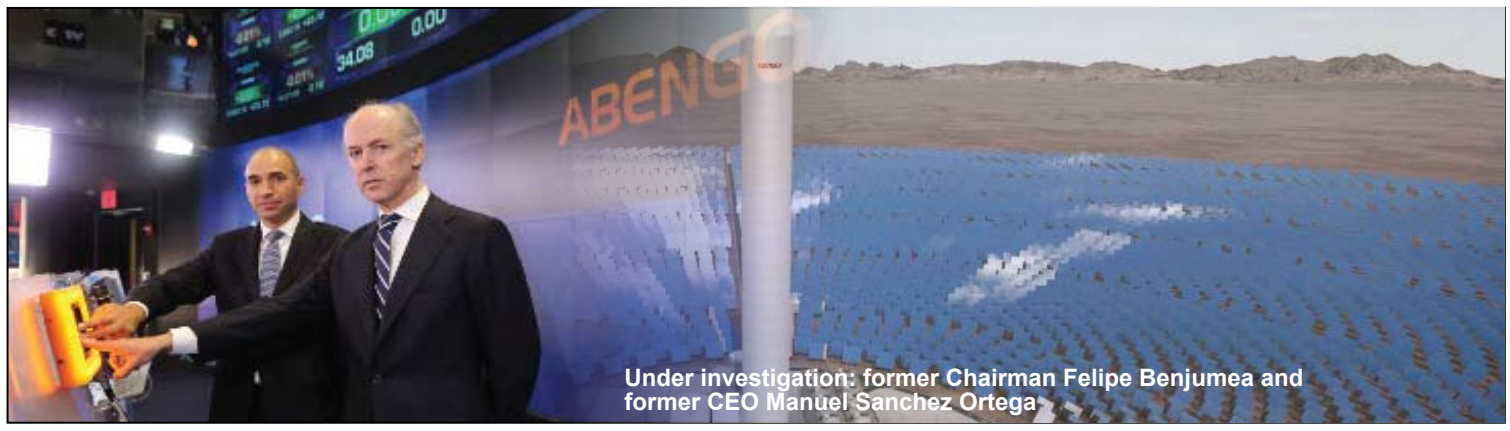
Statkraft says it will no longer invest in new offshore wind energy projects following a change in financial terms from its owner, the Norwegian government.

"Offshore wind power is capital intensive. The reduced financial terms from the owner entail that it is not possible for Statkraft to invest in new offshore wind projects," said Statkraft Chief Executive Christian Rynning-Tønnesen. The firm also said that some international hydropower projects could be postponed as it attempts to balance profitable growth in renewable energy with financial solidity.

"Statkraft will participate in the development of the Triton Knoll project, but not invest further. For Dogger Bank the development of the projects will continue, but Statkraft cannot invest in these," Statkraft said in a statement. It added: "The Dudgeon project is not affected by the decision, and will continue as planned. Statkraft will comply with all commitments and finance our 30 per cent share."

Statkraft added that the 317 MW Sheringham Shoal offshore wind farm in the UK, which started production in 2012 and in which Statkraft owns a 50 per cent share, would not be affected by the decision. "Statkraft's future ownership strategy will be evaluated later," added the firm.

Statkraft holds a 25 per cent share in the planned 4.8 GW Dogger Bank wind project as part of the Forewind consortium. It owns a 50 per cent share in the 900 MW Triton Knoll wind farm and a 30 per cent share in the 402 MW Dudgeon offshore wind farm.



Under investigation: former Chairman Felipe Benjumea and former CEO Manuel Sanchez Ortega

Abengoa under pressure

A court in Spain is to investigate two former Abengoa executives following the firm's announcement in November that it had started insolvency proceedings.

The High Court said it would look into allegations of mismanagement at Abengoa by former Chairman Felipe Benjumea and former CEO Manuel Sanchez Ortega. Both have been ordered to deposit security payments with the court to cover potential liabilities, *Reuters* reported last month.

Abengoa said in November that it was working with creditors to maintain its financial viability and had started insolvency proceedings, which in Spain give companies four months to reorganise and find investment in order to avoid starting a full-blown bankruptcy process.

The firm is said to be close to sealing a preliminary agreement with its creditors that would keep it going until at least the end of 2015. It is under pressure to sell assets in order to reduce the large levels of debt that lie at the heart of its financial woes.

Spain's High Court is responding to a complaint filed by Abengoa bondholders over compensation payments paid to Benjumea and Sanchez. It will also look into accusations of insider trading by Sanchez, *Reuters* reported.

Benjumea stepped down as Chairman in September, while Sanchez resigned as CEO in May. Sanchez later joined investment fund BlackRock.

The High Court has asked Spain's stock market regulator for information on trading in Abengoa shares by BlackRock since August.

Abengoa's financial problems have been caused in part by the firm's rapid expansion in the clean energy sector, and by the sudden withdrawal of generous renewable energy subsidies by the Spanish government in 2013. Its creditors, which include Banco Santander and HSBC Holdings, are considering a €113 million credit line, and have also employed KPMG to go through its accounts to understand it financial situation.

The credit deal would include a €93 million loan and a €20 million credit line, according to reports. Abengoa has appointed Alvarez & Marsal as its advisor and could sell up to €3 billion of assets as well as refocus its business on its engineering and construction units.

Earlier this year Abengoa reported debts of €9 billion and had its long-term rating upgraded by ratings agency Standard & poor's. In November, however, Abengoa's auditors, Deloitte, expressed concerns over the firm's financial situation.

Spain's Industry Minister José Manuel Soria is reported to have said that Abengoa's debts could be as high as €25 billion.

Abengoa has until the end of March 2016 to secure its long-term future with creditors.

Areva strengthens partnership with GE-Hitachi

- Japan deal covers BWRs
- NP sale "making progress"

Areva and GE-Hitachi are to cooperate in the decommissioning and decontamination of boiling water reactors (BWRs) in Japan.

The two firms have signed a memorandum of understanding under which Areva will participate in the preliminary studies for dismantling BWRs as well as investigate other opportunities related to decommissioning and decontamination operations for those reactors.

Areva is currently attempting to reorganise its business to focus its activities on fuel cycle operations and shore up its finances. It said last month that it expects a "heavy" net loss for 2015 and is still in talks over the sale of its Areva TA division and its Areva NP division.

On the sale of its nuclear radiation measurement unit Canberra, Areva said it expected firm offers to be submitted by the end of the year, in view of a sale in 2016.

US radiation detection and protection group Mirion Technologies and investment funds Apax Partners, 3i and Triton are in the running to bid for Canberra, according to reports from *Reuters*.

Areva's board of directors also said in December that efforts to preserve cash flow in 2015 would enable the firm to postpone drawing on its credit lines to early 2016.

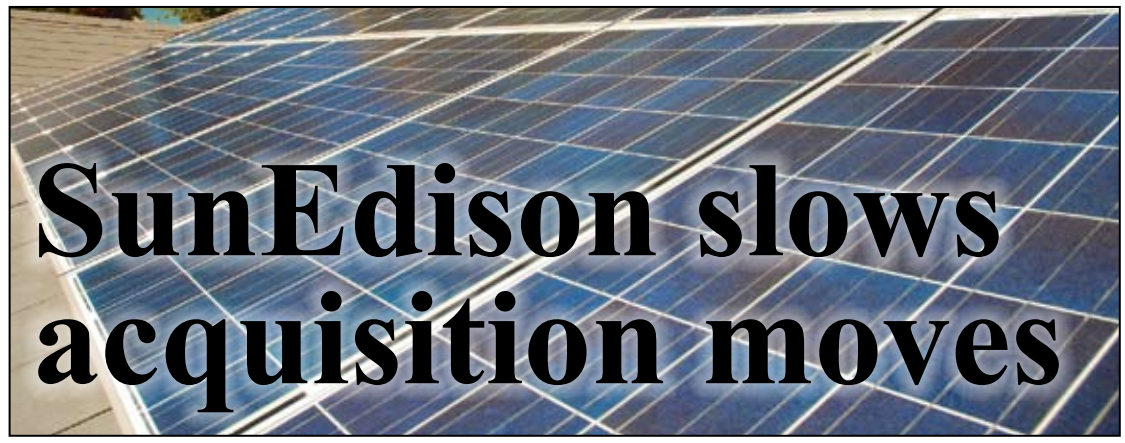
"Negotiations with EDF pertaining to the sale of a majority share of Areva NP are making progress, with a view to a conclusion in the early part of next year," Areva said in a December 2015 statement.

EDF is due to pay €2 billion for a 75 per cent stake in Areva NP. Completion of the deal would also trigger a state-backed capital injection to help Areva raise the €7 billion that it needs to stay afloat.

In November Mitsubishi Heavy Industries (MHI) said it was interested in acquiring a stake in Areva NP from EDF if the deal proceeds.

However it was revealed late last year that liabilities over the Olkiluouto 3 nuclear power plant in Finland, which Areva NP is building, are threatening to derail the deal.

Neither Areva nor EDF are willing to assume liability for future problems at the Olkiluouto 3 project, which is nine years behind schedule and €5 billion over budget.



SunEdison slows acquisition moves

Question marks over SunEdison's business model and debts have put the US renewable energy firm under mounting pressure to scale back its aggressive global expansion.

Siân Crampsie

SunEdison has terminated two key deals aimed at growing its international portfolio in a move to quell investor fears over the firm's business plan.

The USA-based renewable energy company has terminated a securities purchase agreement with Light SA to acquire a 16 per cent stake in Renova, and has pulled out of a deal to acquire Singapore-based Continuum Wind Energy Ltd.

It has also revised a deal to acquire Vivint Solar, a developer of rooftop solar systems, by reducing the $2.2 billion purchase price by 25 per cent.

SunEdison is facing mounting pressure from shareholders to explain the recent fall in the firm's share price and the sustainability of its business model, under which it monetises assets by selling them on to two "yeildco" subsidiaries, Terraform Power and Terraform Global.

In December a SunEdison shareholder filed a class action lawsuit against the firm, alleging that its executive board had made false and misleading statements to attract investors and that its business was "built on a house of cards".

SunEdison's stock declined 72 per cent between June and October 2015, when it announced a 15 per cent staff reduction and a corporate restructuring that would see less reliance on sales to Terraform and more asset sales to third parties.

Brian Wuebbels, SunEdison's CFO, said that the firm remains "committed to Brazil" in spite of terminating the $250 million Renova deal that was originally announced in July 2015.

A second deal among SunEdison, Terraform and Renova to purchase a number of development-stage projects from Renova for sale by SunEdison to Terraform has also been terminated.

However, a previously announced deal between Renova and SunEdison to develop, own and operate 1 GW of utility-scale solar photovoltaic projects in Brazil remains in place, SunEdison said.

SunEdison announced in June that it would acquire Continuum Wind, which has assets in India, for an undisclosed amount.

Earlier this year Latin America Power walked out on a planned $700 million deal with SunEdison after the US firm failed to make an agreed cash downpayment.

Tenders, Bids & Contracts

Americas

Siemens equips US hydro plants

Yellowstone Electric Co. has awarded Siemens a contract to deliver 14 power transformers for the Glen Canyon Dam power plant in Arizona, USA.

The new transformers will contain environmentally friendly ester as an insulating fluid and coolant and will replace the plant's existing transformers, which have been in place since the plant first went into operation.

With the upgrade in the energy infrastructure, the dam and the Glen Canyon hydroelectric power plant will be able to produce approximately five billion kWh of power annually and will supply electricity to 5.8 million customers. Siemens will begin delivering the transformers in late 2017. The units are expected to be installed and begin operation in 2018 and 2019.

Gamesa secures Ohio contract

Gamesa is to supply EDP Renewables with wind turbines for its 100 MW Amazon Wind Farm US Central in Ohio, USA.

Under the terms of the agreement, Gamesa will handle the transport, installation and commissioning of 48 of its industry-leading G114-2.1 MW turbines for the project, located in Paulding County, Ohio. Turbine deliveries are scheduled to begin in Q2 of 2016, and the wind farm is expected to achieve commercial operation by the end of next year. The power generated by the wind farm will be supplied exclusively to an Amazon data centre.

Mexico wind farm will power VW site

Mexico Power Group and First Reserve have placed an order for the wind turbines for the La Bufa wind farm in Mexico, a 130 MW facility that will provide power to Volkswagen factories in the cities of Puebla and Silao.

The companies have contracted Gamesa to build the La Bufa wind farm on a turnkey basis, providing 65 of its G114-2.0 MW turbines as well as other infrastructure and services needed to install the project.

The turbines are slated for delivery in 2016, with commissioning to be completed the same year. The agreement also encompasses the provision of the related operation and maintenance services over the long term.

GE secures plant service contracts

GE's Power Services business announced that it has secured more than $310 million in services orders for three power plants in Latin America.

Under the contracts, GE will boost the efficiency and reliability of new and existing combined cycle generating facilities in Mexico, Chile and Trinidad and Tobago.

In Mexico it will provide long-term maintenance services for three 7FA.05 gas turbines and a D11 steam turbine that will be installed at the new TECHGEN combined cycle plant in the Pesquería area.

In Chile it will provide long-term services for the 379 MW Nueva Renca Power Plant,

In Trinidad & Tobago, GE will replace two MS7001E (Frame 7E) gas turbines at Power Generation Company of Trinidad and Tobago, Ltd's. (PowerGen Ltd.) 236 MW Penal Power Station with two MS7001EA (Frame 7EA) gas turbines.

Asia-Pacific

Gamesa strides in India

Gamesa has signed its first contract with India's Tata Power, the company has announced.

Gamesa will build a 100 MW wind farm on a turnkey basis using 50 of its G97-2.0 MW class S turbines. The site is located in Andhra Pradesh state and the turbines will be optimised for the low wind speeds there.

Gamesa will also provide long-term operations and maintenance (O&M) support after the wind farm is commissioned in May 2017.

Japan gains first EnergyIP installation

Siemens has implemented its grid application platform EnergyIP in Japan for the first time.

Working in collaboration with Mitsubishi Electric, Siemens has deployed the system as part of an upcoming smart meter rollout. EnergyIP will act as the central platform for the Meter Data Management (MDM) application at Shikoku Electric Power Company. This platform provides the foundation on which the data handling processes are to be consolidated, and the MDM application will collect and prepare electricity consumption data for onward processing.

The Japanese Electricity System Reform Act calls for work to begin in 2016 to replace all electro-mechanical power meters in Japan with smart meters that feature a communication function, and for replacement to be completed by 2024. Shikoku Electric plans to install and put into operation up to approximately 3 million smart meters. As an MDM application solution, Siemens' grid application platform EnergyIP will collect record and process the consumption data of all these meters, and support the transmission of data to downstream business processes.

Sembcorp signs Myanmar contract

SembCorp Utilities Pte Ltd., a wholly-owned subsidiary of Sembcorp Industries Ltd., has signed a memorandum of agreement with Myanmar's Department of Electric Power Planning (DEPP) to invest in and develop a 225 MW gas fired power plant in central Myanmar.

Located in the Myingyan district of the Mandalay division, the $300 million power plant is set to be the largest gas-fired independent power plant in Myanmar and will play a key role in easing Myanmar's severe deficit.

The build-operate-transfer project was awarded after an international bidding process called by Myanmar Electric Power Enterprise (MEPE), and advised by International Finance Corporation of the World Bank Group. Sembcorp will have an 80 per cent stake in this project, while its partner MMID Utilities will hold the remaining 20 per cent.

Expected to be completed in 2018, the project will supply power to MEPE under a 22-year power purchase agreement (PPA).

Clarke provides Queensland backup

Diamantina Power Station (DPS) in the city of Mt. Isa in the Australian state of Queensland has selected Clarke Energy to supply and install the country's first 2.6 MW 616 diesel engine from GE's Distributed Power business. The 616 diesel unit will help give the station needed "black start" capabilities to allow it to return to service in the event of a system outage.

DPS operates in an isolated regional grid that is not connected to the National Electricity Market. The Mount Isa region is affected by high levels of lightning activity during summer that can interrupt power supplies. As a result, the new black start capability is critically important to this regional network.

The DPS site, which is jointly owned by APA Group and AGL Energy, includes a 242 MW natural gas combined cycle power station and the adjacent, 60 MW Leichhardt Power Station (LPS) – an open cycle, dual-fuelled gas turbine plant that provides backup power with black start capabilities.

The 616 unit is to ensure that black start is available under any circumstance as the loss of this facility would impose serious difficulties for the region in the event of a system black out. The GE 616 will be used as a black start diesel unit for the combined cycle power plant.

Europe

Dong places MHI order

Dong Energy has placed an order with MHI Vestas Offshore Wind for turbines for the 330 MW Walney Extension West project in the UK.

MHI Vestas will provide its V164-8.0 MW units for the project, as well as a five-year full-scope service contract with an availability guarantee. The 8 MW units have been optimised for the Walney project, using a power mode allowing them to be able to deliver a maximum output of 8.25 MW.

The project is the second order for the V164-8.0 MW, and with 40 units it will be the largest 8 MW project to date, MHI Vestas said.

The Walney Extension project is located in the Irish Sea, 35 km northwest of the Fleetwood and Blackpool coast. The Walney Extension West is the first phase of the 660 MW Walney Extension offshore wind farm project.

RTE invites tenders

French transmission system operator RTE has invited tenders for maintenance of the electric structures at sea for offshore wind farms' connection to the national grid.

The tender is invited into three lots and includes a storage facility, maritime equipment, repair services and accessories for the repairs.

The deadline for the submission of bids is January 4, 2016.

Dong awards substation contract

Balfour Beatty has been awarded a £25 million project by Dong Energy to construct a high voltage onshore substation as part of the new Hornsea Project One offshore wind farm.

Work to construct the new onshore substation is planned to start in January 2016, with Balfour Beatty responsible for the build at North Killingholme, North Lincolnshire. The facility will enable the transfer of electricity from the Hornsea offshore wind farm to the adjacent, existing National Grid substation.

The project includes the construction of core buildings and compounds, the installation of low voltage electricity equipment, low voltage cables, and communication cables as well as roads, paths, drainage and landscaping. Balfour Beatty will be the principal contractor during the 2.5-year contract, which also includes the installation of high voltage electrical equipment by third parties.

Södra Cell selects Doosan Škoda Power turbines

Doosan Škoda Power has been selected to supply a 64 MW industrial steam turbine to the power plant extension at Södra Cell AB's pulp mill in Värö, Sweden.

The contract for the MTD40CE model turbine also includes the installation of a condensation system and associated piping. The turbine will be installed in the plant's new biomass extension, which aims to provide a cleaner supply of electricity for the pulp mill.

The Värö contract is Doosan Škoda Power's sixth in Sweden since 2007, when it first provided a 60 MW industrial steam turbine, also at the Värö plant.

International

Gensets on standby for Kuwait hospital

Rolls-Royce is to deliver 23 MTU Onsite Energy standby generating sets as part of the expansion and modernisation of the existing Al Farwaniya hospital in Kuwait City.

MTU Partner Albisher & Z Alkazemi Company (A&A) received the order from prime contractor Sayed Hamid Behbehani & Sons Co. (SHBC) in Kuwait. The diesel-powered gensets based on MTU Series 4000 20-cylinder engines each deliver a maximum of 2750 kVA of prime power.

"In case of any instability in the power supply, the 23 gensets keep the hospital running smoothly by delivering some 50 MW of power in a matter of seconds. With ambient temperatures ranging as high as 55°C, keeping the hospital's air-conditioning system up and running is crucial," said Ashraf Tamim, General Manager of A&A.

Posco preferred bidder

Korean firm Posco Energy has been selected as the preferred bidder in a tender for the construction of two power plants in Botswana.

The 300 MW Morupule B Phase II Project was commissioned by the Botswana Ministry of Minerals, Energy and Water Resources through an international public tender. Posco formed a consortium with Marubeni of Japan to submit an $800 million bid for the project.

Construction will begin in late 2016 on the plant, which is expected to be completed and operational by May 2020.

The project forms part of Botswana's plans to add 1200 MW of capacity to its grid in order to reduce imports of electricity from South Africa.

ABB to power Israel solar plant

ABB has supplied 36 inverters to one of Israel's largest and most prestigious solar projects, the firm says.

The 55 MW plant in western Negev was planned and funded by Enlight Renewable Energy. ABB has supplied 36 of its ULTRA-1400 inverters for the plant, which is supplying energy to 18 000 households in Israel.

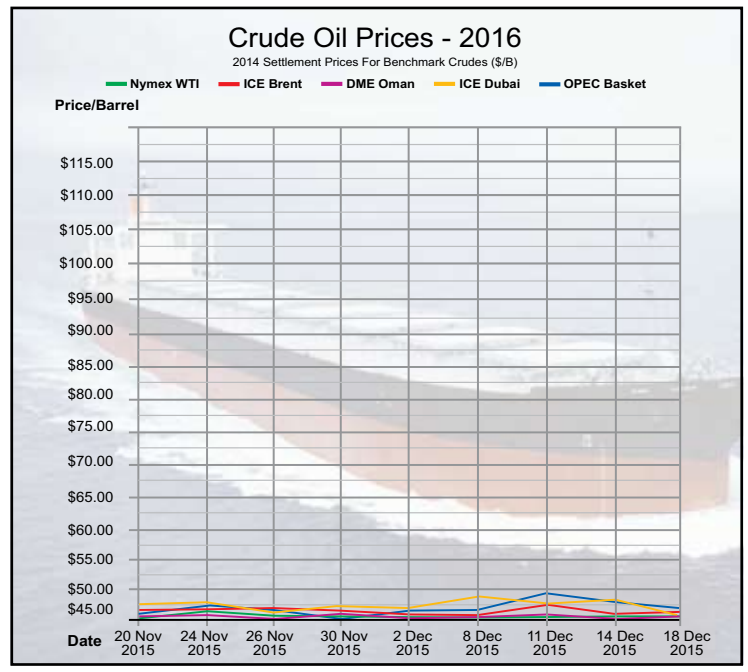
One key criteria used in the selection of the ULTRA inverter was its four independent Maximum Power Point Tracking (MPPT) input channels, which provide maximum flexibility and energy harvesting across a broad range of operating conditions, including the use in combination with single axis solar trackers under the extreme heat of Negev.

ABB says the inverters are working well under the harsh conditions.

Oil

Low oil prices expected throughout 2016

- Analysts say $50-60/b is new mid-term norm
- Saudi Arabia needs around $106/b to cover costs



David Gregory

Saudi Arabia is giving no ground in what can only be seen as the oil price challenge. Since the Opec meeting in Vienna in early December, when the cartel decided to make no effort to adjust production, crude prices continued to fall and entered Christmas week with oil prices under $37/b, their lowest in 11 years.

For Opec members and other big oil producers, the price decline is taking its toll. Many Opec countries – such as Venezuela and Iran – need high oil prices to maintain their budgets and all Opec economies are expected to experience considerable turmoil before the market rebalances.

A number of energy analysts do not see a turnaround in the oil market until the end of 2016 or even later, and some see oil going to $20/b before it is over, although by that point, even Saudi Arabia, which has drawn significantly upon its cash reserves and issued new debt, will likely be a casualty of a situation that many see as its own doing.

Saudi Oil Minister Ali al-Naimi has stated that his country is prepared to see the price fall to $20/b if that is what it will take to force high-cost producers out of the market and prevent the erosion of Saudi Arabia's position in the global oil market.

But none of the oil producers – the Saudis least of all – are willing to cut production out of fear that the slack will go to a competitor, and in that case oil producers are pumping all-out in order to keep up with one another, whether they are Opec members or not.

Once the swing producer within Opec, and willing to adjust production to keep oil prices high, Saudi Arabia decided a year ago that it would no longer yield market share to other oil producers.

Its current policy is designed particularly to force US shale oil producers to halt production. This has worked to some extent but not all shale producers are operating at high costs and some oil economists argue that the price will have to fall to $20/b before shale production stops.

Economists argue that this strategy is short-sighted, noting that shale producers will come back into operation once prices return to a point where it is profitable for them to operate.

For several months Saudi Arabia has produced at a rate of more than 10 million b/d. Opec production is averaging 31.5 million b/d and Russian output is exceeding Saudi Arabia's.

Furthermore, US output, which topped 10 million b/d earlier this year, has started to fall back, but is still around 9 million b/d, and it remains to be seen what impact US crude will have now that Congress has agreed to lift the ban on US exports, put in effect in the 1970s during the days of the Arab oil embargo.

Saudi Arabia can produce oil at a cost of around $7/b, but it cannot manage a budget with oil priced at that level. The country needs an oil price of around $106/b in order to cover its costs and in mid-December, reports were circulating that its 2016 budget would begin to dismantle subsidies and introduce taxes, opening up a whole new world for the inhabitants of the magic kingdom.

Saudi Arabia relies on oil-related sales for around 80 per cent of its revenues. However, as oil prices fall, the hole in government expenses will have to be taken up somewhere, and some economists have stated that five more years of low oil prices could plunge the Saudi economy into serious trouble.

The Saudi deficit for 2015 is estimated at around $130 billion, and low oil prices have forced it to dig into foreign cash reserves that have declined from around $747 billion in August 2014 to around $640 billion now.

Already analysts are saying that the day of $100/b oil is over. They argue that the shock the oil market is now experiencing is not temporary, but permanent, and that countries such as Opec members that have only oil as their main source of income, need to take urgent steps to diversify their economies.

Saudi Arabia has been urged to cut spending and encourage private sector investment. Analysts say that despite the Kingdom's efforts to move shale oil and gas out of the picture, that scenario is unlikely.

Demand for oil will have to make a significant comeback in a very short time if prices are to get back to anywhere near to what they were and, while as everybody knows it is impossible to predict the oil market, analysts are beginning to speak of oil at $50-60/b as the new mid-term norm.

Gas

Israel gas development faces political obstacles

Development of Israel's offshore gas sector is moving forward but the country still has to overcome significant political problems with its neighbours.

Mark Goetz

Israeli Prime Minister Benjamin Netanyahu signed a framework agreement in mid-December that is designed to create the circumstances for the partners in the offshore Tamar and Leviathan gas fields to proceed with developing the fields to not only boost capacity to supply Israel's domestic market, but to also export gas to regional neighbours.

Netanyahu signed the bill in his capacity as Economy Minister, a post he assumed late last year when the seated minister resigned due to his reluctance to sign the agreement under the application of Clause 52, which allows the minister to override the Anti-Trust Authority (ATA) in cases of national security or manners of diplomacy.

US explorer Noble Energy and Israel's Delek Group, the partners in the two gas fields, have been very lucky in the Israeli offshore, discovering at least six gas fields, the largest of which are Tamar and Leviathan. No other group has discovered hydrocarbons offshore Israel as yet and the partners are the only companies supplying domestic natural gas to the Israeli market through the Tamar field.

But because they hold all of Israel's offshore gas resources and are the only ones capable of producing and supplying gas, the Israeli ATA deemed their partnership in December 2014 a monopoly and insisted that they divest themselves of their discoveries. As a monopoly, the partners would not be able to provide Israeli consumers with competitive prices, the ATA contended.

Naturally the companies were opposed to this ruling and halted further exploration and development of the fields, whose gas resources are estimated at 11 trillion cubic feet (tfc) and 22-plus tcf, respectively.

After a number of suggestions, the Netanyahu government and the companies reached a compromise that will see the sale of two small fields and Delek selling its interest in Tamar.

The ATA, the Knesset Economics Committee and Israel's main opposition party continue to object to the framework agreement and now the matter will go at some point in the future before the country's High Court of Justice.

Delek and Noble welcomed the action taken by the prime minister. Noble said in a statement: "The Natural Gas Framework establishes the regulatory certainty and stability necessary to proceed with development of both the Tamar expansion and Leviathan, while providing transparency for future domestic pricing and natural gas competition in Israel." Noble, the operator of both fields, said it has been moving ahead with technical and financing measures for phase two expansion of Tamar and the development of Leviathan and that it planned to make a final investment decision on both projects before the end of 2016.

Noble and Tamar have signed several letters of intent (LOI) designed for commercial agreements covering the export of natural gas. The LOIs have been signed with the operators of two LNG plants that sit idle on Egypt's Nile Delta coast due to a lack of supply from Egypt, and with a private Egyptian firm, Dolphinus Holdings, which intends to supply Israeli gas to Egyptian industries. LOIs have also been signed with Jordan and the Palestinian Authority.

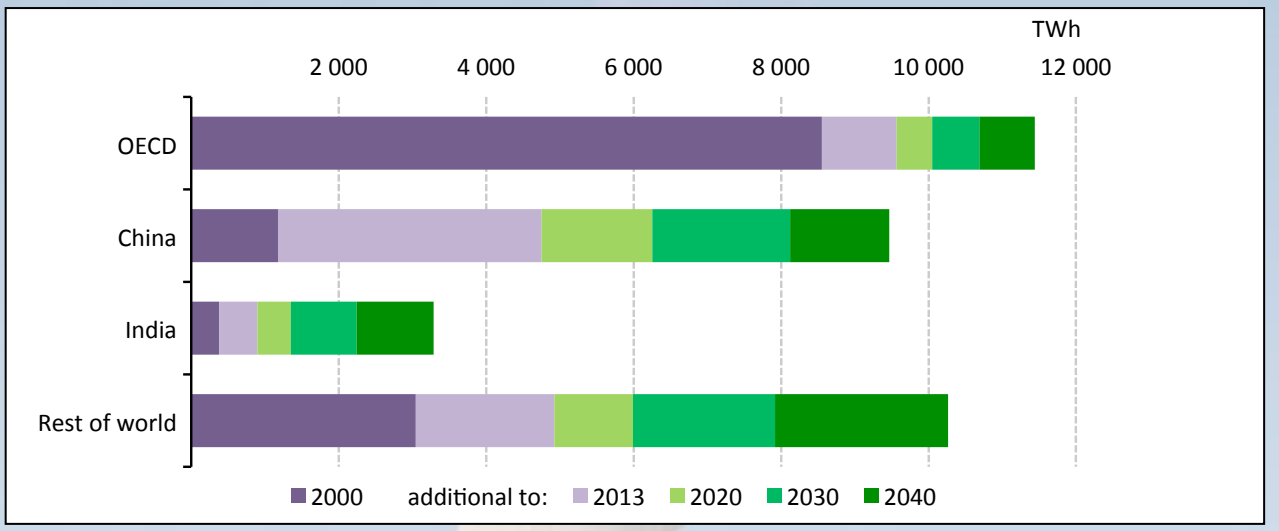
Last month, negotiations with the operators of the LNG plants at Damietta (Union Fenosa Gas) and Idku (BG Group) were halted by the Egyptian government following the ruling by a court of international arbitration in which Egypt was ordered to pay $1.76 billion in compensation for losses suffered by Israel over Egyptian gas supplies that were interrupted and eventually halted in the wake of the overthrow of Hosni Mubarak.

Cairo has demanded that Israel wave the fine if it wants to export gas to Egypt, but until now, the matter remains unresolved, although it will undoubtedly receive more attention now that the framework agreement has been signed. Should the High Court approve the agreement, overcoming this latest obstacle in the way of Israeli exports would likely gain priority.

The political reconciliation in late September between Israel and Turkey has also put the idea of a gas pipeline from Leviathan to Mersin back onto the table. However, the Cyprus problem and Turkey's 40-year military occupation of the island stands in the way.

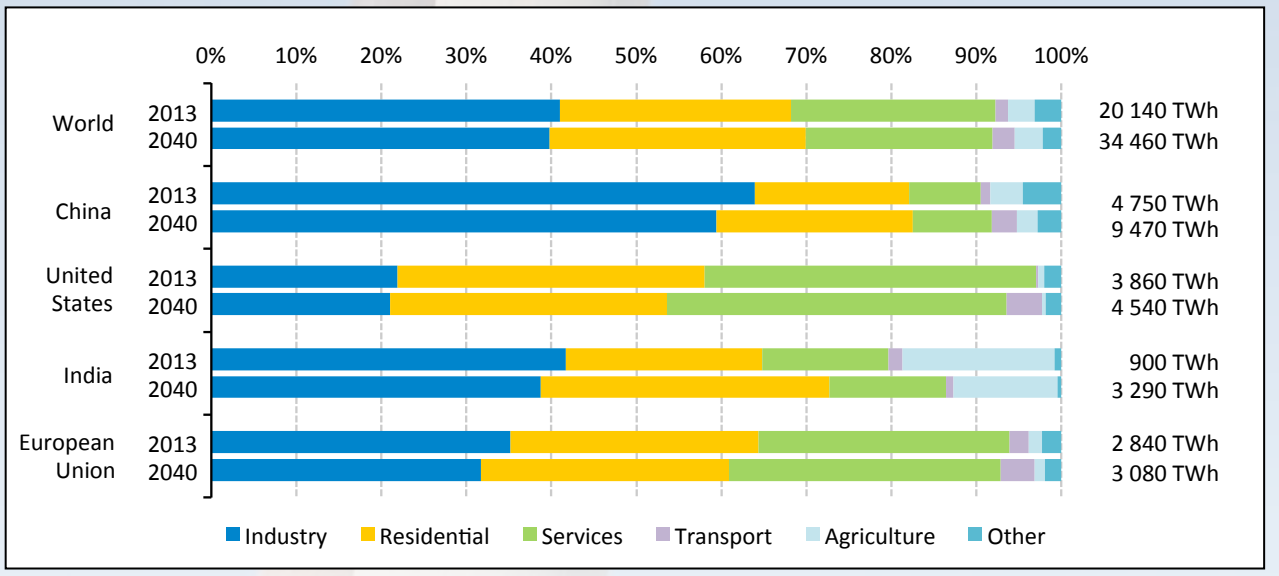
The pipeline would need to pass through Cypriot waters. UN-sponsored talks to resolve the long-running dispute are underway and there are positive sounds that a settlement could be reached this year. Should that happen, Israeli gas could have more potential customers.

Electricity demand by region in the New Policies scenario



World Energy Outlook 2015, © IEA/OECD, Figure 8.1, page 305

Electricity demand shares by sector and selected region in the new policies scenario



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Electricity demand by region and scenario (TWh)

			CAAGR **	NPS		
	2000	2013	2000-2013	2020	2025	2030
OECD	**8 553**	**9 568**	**0.9%**	**10 052**	**10 371**	**10 692**
Americas	4 297	4 694	0.7%	4 954	5 089	5 258
United States	3 590	3 859	0.6%	4 046	4 119	4 220
Europe	2 820	3 168	0.9%	3 293	3 397	3 474
Asia Oceania	1 435	1 706	1.3%	1 806	1 886	1 960
Japan	958	952	0.0%	956	975	996
Non-OECD	**4 595**	**10 576**	**6.6%**	**13 598**	**15 854**	**18 284**
E. Europe/Eurasia	1 104	1 404	1.9%	1 491	1 586	1 697
Russia	677	863	1.9%	882	935	996
Asia	2 129	6 770	9.3%	9 113	10 784	12 548
China	1 175	4 751	11.3%	6 254	7 207	8 123
India	376	897	6.9%	1 351	1 757	2 241
Southeast Asia	322	716	6.3%	993	1 202	1 440
Middle East	359	803	6.4%	1 043	1 207	1 382
Africa	385	621	3.7%	799	962	1 176
Latin America	618	979	3.6%	1 151	1 315	1 482
Brazil	327	502	3.4%	594	680	766
World	**13 147**	**20 144**	**3.3%**	**23 650**	**26 226**	**28 976**
European Union	2 605	2 836	0.7%	2 907	2 975	3 014

World Energy Outlook 2015, © IEA/OECD, Table 8.1, page 307

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Source: World Energy Outlook 2015

Asian clean energy investments surge

Asia's investments in clean energy have surged since 2005. Improving policy, better financing and the Paris Agreement may spur growth further, even though climate change is rarely at the top of national agendas.

Joseph Jacobelli

The growth of clean energy power generation in the Asia Pacific region has outpaced other regions in the world, even though climate change concerns *per se* were rarely at the top of the agendas of governments in the region.

Pollution reduction, green jobs and technological innovation drive Asia's push. China has significantly led, and may continue to lead, the sharp advance, while Japan, Thailand and other economies have made major strides, and should continue to do so.

The COP21 talks in Paris in December, with many leaders from Asia in attendance, may spur growth going forward. The Asian Development Bank (ADB) and the new Asian Infrastructure Investment Bank (AIIB) should boost funding of green projects.

Asia's investments in clean energy, which sharply cuts CO_2 emissions compared with coal, oil and other fossil fuels, have surged since 2005. The spending comes even though climate change is rarely at the top of national agendas. From Australia to Japan to the Philippines, more power is coming from biomass, geothermal, solar and wind.

Globally quarterly capital expenditure on clean energy is approximately $70 billion while the Asian region accounts for more than half of the amount, namely $40 billion each quarter, compared to less than $20 billion in 2010 and under $4 billion in 2005, according to Bloomberg New Energy Finance.

China has been the unequivocal leader in clean energy investments in the region, in absolute terms and also in terms of shifting its primary energy sources away from the nation's traditionally key fuel, coal. Chinese investment in domestic clean energy jumped in the past five years and is forecast to see another sharp rise through 2020, based on government targets.

The wind power developers will be at least doubling installed capacity to 200 000 MW by 2020. This is regarded as a minimum target that is likely to be exceeded with estimates indicating capacity could reach as much as 250 000 MW. Solar power generation capacity should almost triple from the 2015 level.

As at the end of September 2015, the nation had 37 150 MW of solar power, including 31 700 MW at utility scale plants and 6250 MW in distributed generation. An early 2015 estimate for the installed capacity by 2020 was that China will have at least 100 000 MW in solar in total but now 150 000 MW is regarded as a minimum for 2020. To complement the massive expansion in wind and solar power China is also targetting conventional hydroelectric power capacity to reach 340 000 MW.

Much of this new capacity is being developed by large nationwide operators such as China Longyuan Power Group Corp., the country's largest and undisputed renewable energy development leader.

The company controlled 14 568 MW of wind capacity is at the end of June 2015. It should have added 1000 MW in the second half of 2015 and targets to expand at the rate of 2000 MW per annum in the near-term, which would mean a wind capacity of at least 17 600 MW by the end of 2016.

Longyuan has been able to generate an average return on equity of about 9 per cent in the past five years though its realised wind revenue per MWh is relatively low by global standards, just Yuan588 ($90.74) per MWh in the first half of 2015. The leading developer is also pioneering offshore wind such as the 400 MW Nanri Island project in Fujian province, started in late 2015 and to be completed by 2018. The project is one of more than 40 offshore wind projects with a combined generating capacity in excess of 10 000 MW.

An essential component in China's massive renewable energy targets to 2020 lies with accelerating investments in its electricity distribution network. The expansion has lagged behind the addition in capacity and has been one of the reasons for renewable energy curtailment in some regions. In August, the National Energy Bureau had stated that investment by China's power grids for transmission and distribution construction would be a minimum of Yuan2 trillion ($308.6 billion) between 2015 and 2020, of which approximately Yuan300 billion ($46.3 billion) was expected in 2015.

Reducing hazardous and unsightly pollution are motivating Chinese leaders more than worries about climate change. This was highlighted most recently when authorities in the capital, Beijing, issued the first ever red pollution alert in early December which was followed just a few days afterwards with a second alert. The red alert is the highest of a four-level system first launched in 2013. The alert advises local residents to stay indoors and activates a myriad of limitations on vehicle usage, shuts certain industrial plants and halts some construction work.

While China has led renewables investments, Japan, Thailand and other Asian nations have also stepped up spending.

With top leaders from China, India, Australia and Japan attending the COP21 climate summit in Paris, clean-energy investments in Asia are likely to increase. Wind, solar, biomass and other forms of clean power have been expanding, and COP21 should ignite renewed momentum for national policies promoting renewables. Even so, incentive mechanisms in some Asian economies have occasionally faltered. In the Philippines, for example, a solar project must be 80 per cent complete before developers can apply for support.

Asia's clean energy projects sometimes struggle to secure financing, as many are smaller than conventional projects. Lenders may also worry about weak incentives in countries such as the Philippines, and policy U-turns in Australia. Funding may start to improve as multilateral lenders in the region set policies favourable to renewables. The ADB has promised to increase clean energy lending, and the AIIB has said green projects are a priority.

In addition to regional institutions such as ADB and AIIB emphasizing the opportunity to invest in clean energy, financial institutions and corporations are also open to exploring new financing instruments such as Green Bonds or Climate Bonds. Between 2010 and 2012, issuance only amounted to $133 million. This rose to $500 million in 2013, to over $1.2 billion in 2014 and two $3.8 billion year to mid-December 2015. Of the total amount the greatest issuance came from Australia (19 per cent of total), China (18 per cent), Japan (14 per cent), India (12 per cent) and the Philippines (11 per cent). In 2016 and beyond, Asian insurance is likely to outpace that of the rest of the world.

The growth of clean energy generation capacity in the Asia-Pacific region faces at least two challenges.

Many Asian economies are highly sensitive to cost of energy, making wind and solar less appealing relative to energy from thermal coal and LNG, whose current prices are at multi-year lows. In China, for example, wind and solar generation costs Yuan 500-1000 ($77.16 – 154.32) per MWh, this compares to an average of just Yuan 400 ($61.73) per MWh for coal-fired power generation.

Another test for clean power capacity growth is the move toward competitive markets in China, Japan and other regions where comprehensive policies promoting the use of clean power are still being fine-tuned.

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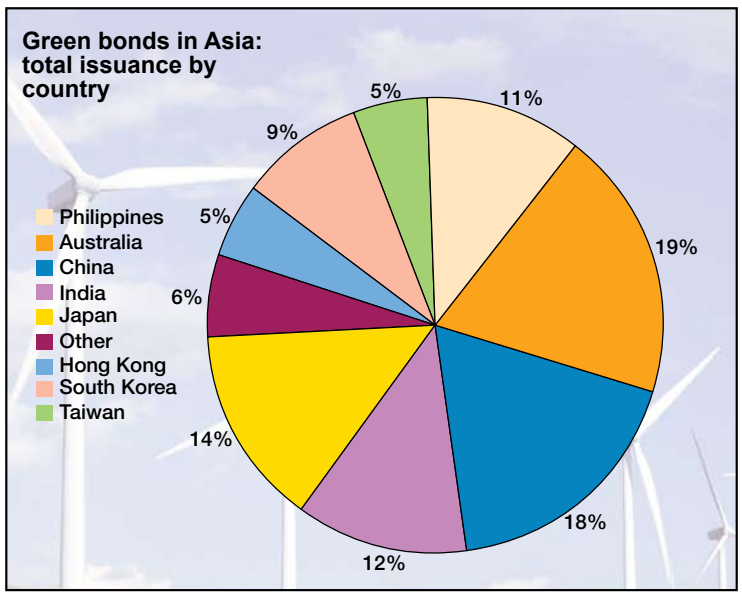

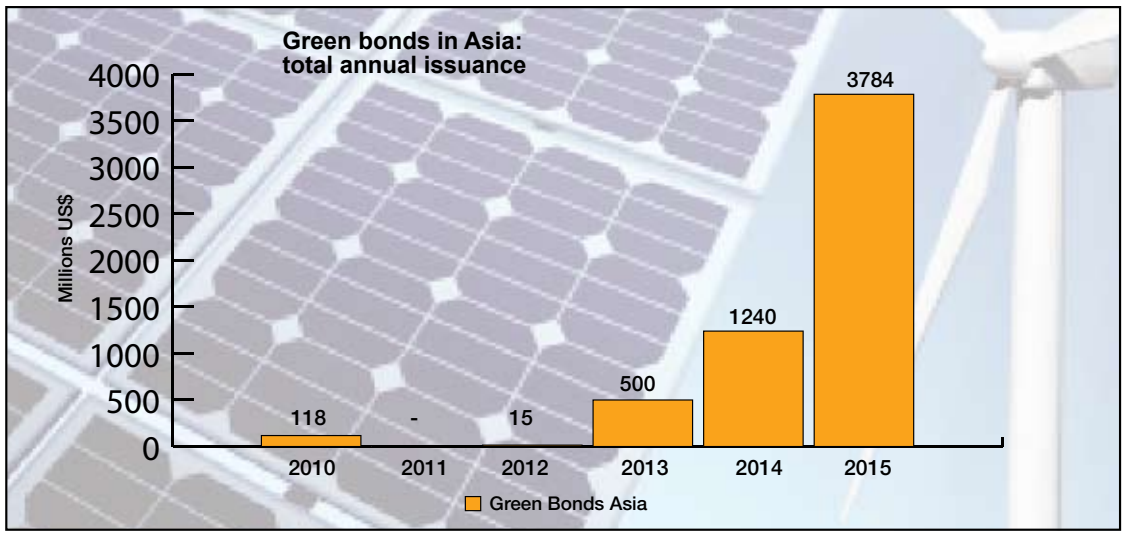

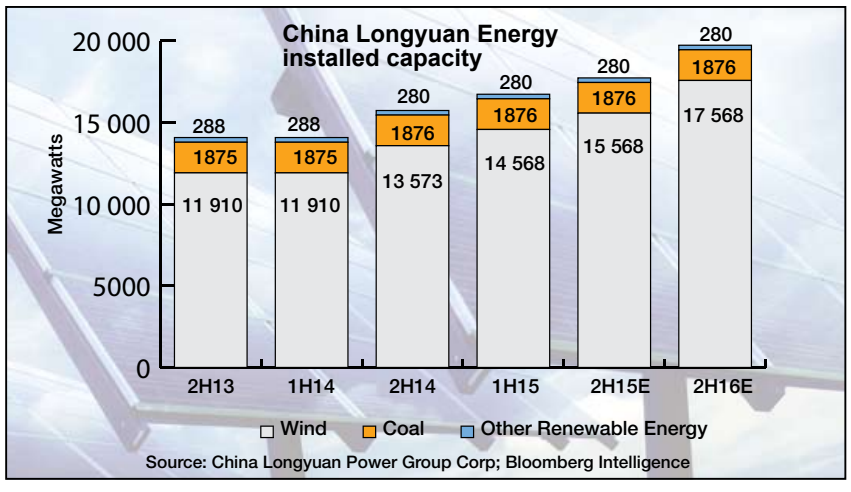

Moving towards EU market harmonisation

National European energy systems were designed to cover national needs. This, as well as the existence of divergent trading rules, impedes the current move towards market harmonisation. So will fragmented European electricity markets soon become a thing of the past?

Aleksandar Cvetkovic

It is difficult to see into the future, but many scenarios suggest we should anticipate a significant increase in electricity demand in the coming decades. Even if we speculate that more advanced technologies and people's elevated environmental responsibility may reduce electricity consumption in developed countries, we have European regions where the increasing standard of living and rapid economic development will definitely see further requirements for an increase in power.

The challenge to cover increased needs can only be achieved through the efficient utilisation of electric power production in a fully integrated internal European market with harmonised rules, allowing for short and long term trading, balancing services and security of supply across borders.

Recently we have witnessed a significant expansion of renewable electricity generation in Europe – generation that may change intermittently, depending on the time and changing weather conditions. To cope with the flexibility challenges related to the growing share of renewable, non-dispatchable generation plants, electricity must be increasingly moved from one country to the other. Before a cross-border power trade can be executed, the required transport capacity must be available. Since transport capacity is not unlimited, traders must bid for and purchase the needed network capacity before a cross-border deal can be accomplished.

Unbundled Transmission System Operators (TSOs) responsible for developing, maintaining and operating the transmission networks should allow non-discriminatory third parties access to these networks. Consistent with European legislation, the expectation is that the free transport capacities are assigned according to a fair market-based allocation process.

The European Commission started to introduce harmonised trading rules back in 2009 with the goal of creating a pan-European electricity market that enables the free movement of electricity between the integrated markets – a process called "market coupling". Actually, for the day-ahead market a Trilateral Market Coupling (France, Belgium, and The Netherlands) was introduced even earlier in 2006 through a cooperation between Exchanges and TSOs. Since that time we have achieved considerable milestones towards the integration of EU wholesale power markets.

In 2010 market coupling in Central Western Europe (CWE; covering Benelux, France and Germany) was launched – since then CWE has been volume coupled with the Nordic region via the Interim Tight Volume Coupling ITVC (the Nordic countries have had implicit auction mechanisms since 1993 and their cross-border electricity market is already harmonised to a great extent).

An important step in the European market integration was taken in February 2014, when Price Coupling in North Western Europe (NWE) was successfully put into live operation, covering the region of CWE, Great Britain, the Nordics and the Baltics. NWE, stretching from France to Finland, uses a common day-ahead Price Coupling of Regions (PCR) solution to calculate the power price. PCR is a single price coupling solution using the algorithm Euphemia (abbreviation for Pan-European Hybrid Electricity Market Integration Algorithm) to calculate electricity prices, net import and export positions across Europe and allocate cross-border capacity on a day-ahead basis.

Additionally, in 2014 Southwestern Europe (SWE; Portugal, Spain and France) joined the Northwestern Europe (NWE) day-ahead coupling and the project was renamed as Multi-Regional Coupling (MRC). Czech Republic, Slovakia, Hungary and Romania successfully implemented the 4M Market Coupling (4M MC) also using the PCR solution and hence paving the way for the future integration with the MRC project (i.e. the integration of the Central Eastern Europe (CEE) with the NWE region).

The Irish and Northern Irish energy regulators published a consultation in 2014 on the high level design of the wholesale electricity market that will replace the Single Electricity Market (SEM) by I-SEM (Integrated SEM) around 2016, guaranteeing compliance with the EU legislative measures and seeking a common mechanism for electricity trading across national borders. The next milestone took place in February 2015, when Italian borders (Italian-Austrian, Italian-French and Italian-Slovenian) were coupled with the MRC. Finally, in May 2015 CWE implemented the Flow-Based capacity calculation for the first time in Europe.

Having introduced day-ahead market coupling across EU member states, the liquidity and transparency for electricity markets is improving and we now have greater price convergence. It is much simpler to trade since electricity is sold together with the available interconnection capacity. Still, the potential of the existing transmission networks could be used more efficiently.

There is a pressing need to optimise the algorithm of how available capacity is calculated, so that global social welfare can be maximised. The historically used Available Transmission Capacity (ATC) method includes high security margins that considerably restrict the cross-border flows that are possible. The new more sophisticated Flow-Based (FB) method takes into account the increased volatility from renewable production and has a more detailed grid description. Consequently the capacity available for cross-border trading is increased and this leads to electricity prices that reflect the actual grid situation more accurately.

The next step from an IT perspective is to introduce the FB method for cross-border capacity calculations, already successfully utilised in the CWE region, on a larger European scale. Going forward, following the ambitious objective of achieving a "European Copper Plate" with the same electricity price for the entire EU region, a functioning intraday trading market with continuous implicit capacity allocations needs to be implemented.

One important step in this direction is the joint initiative by five Power Exchanges together with the TSOs from 12 countries (this is the so called XBID project) to create a joint integrated intraday cross-border market based on an EU Regulation for Capacity Allocation and Congestion Management (CACM). The current ambitious target for the XBID project implementation is 2017.

Cvetkovic: the market harmonisation "project" is unprecedented in its size and complexity and requires coordination and massive investments on several fronts

Even in the fully harmonised electricity market, imbalances may occur as a result of imprecise consumption forecasts or generation/grid faults. The Finnish, Norwegian and Swedish TSOs agreed in 2010 to form a joint project with the objective to establish a harmonised imbalance settlement model for the three Nordic countries. The project Nordic (Im)balance Settlement (NBS) should be operational in 2016 and we anticipate the common imbalance rules should make it easier for a retailer to enter the market, thus promoting a more competitive and innovative end user market.

Without any significant investments in the basic network infrastructure any legislative measures regarding market harmonisation supported by innovative IT projects will not be successful in facilitating more powerful and better integrated electricity networks across the continent to enable certain EU regions to emerge from isolation. We must invest in electricity networks to upgrade existing and build new interconnectors to allow (renewable) energy to be transported across large geographical areas from the point of generation to the end user.

In order to increase the focus of the investments and coordinate on the European level, in 2013 the EU Commission introduced "Projects of Common Interest" (PCIs). The PCIs list of energy infrastructure projects identifies 248 priority projects aimed at increasing competition and the security of energy supply. The total investment volume required for the implementation of all 248 projects by 2020 is estimated at €119 billion, with approximately two-thirds of it being for investments in the electricity transmission networks and one-third for the gas pipelines.

Although 72 PCIs, costing €50 billion, are well on the way to being implemented by the end of 2017, the investment volumes in electricity transmission infrastructure remain a major financing challenge. The additional complication is that in parallel with the PCI projects, the TSOs are expected to invest substantially as part of the ENTSO-E Ten-Year Network Development Plan (TYNDP), which contributes greatly to the integration of Renewable Energy Sources.

At present the single price coupling solution, PCR, for day-ahead wholesale electricity markets covers some 85 per cent of the whole European power consumption. There is a realistic hope that in the next decade the ongoing market harmonisation processes will move the EU countries/TSOs towards tighter intraday cooperation with a common goal leading to an increase in the welfare of the European Economy.

However, the market harmonisation "project" is unprecedented in its size and complexity and requires coordination and massive investments on several fronts. The EU energy law framework that harmonises the legal rules for electricity trading in the member states is not enough; in addition coordinated massive investments in the IT, generation and network infrastructures are essential prerequisites for success. Hence, we are still distant from the vision of a common electricity price across the whole continent, but the excitement of a better energy world in the future is omnipresent.

Aleksandar Cvetkovic is Head of Logistics and Settlement at Brady Energy.

Pulling out all the stops on shale gas

Having issued a policy statement on shale gas and oil development in August last year, the UK government has made its intentions clear for the sector. Law firm Bond Dickinson sets out the current criteria for calling-in planning applications and recovering appeals and explores what the policy means for shale gas development.

Kevin Gibbs and **Sara Wex**

With the publication of the Policy Paper – 'Shale gas and oil policy statement by Departments for Energy and Climate Change (DECC) and Communities and Local Government (DCLG)' – on August 13, 2015, the UK government made it clear that it intended to remove further perceived obstacles and to speed up the planning process for shale gas. The move served to put local councils on notice that the government will intervene to ensure that decisions on shale drilling applications are made (and appeals disposed of) without delay.

Wex: local communities need to be convinced of the benefits

Acting in line with its policy, on November 26, 2015, the UK government confirmed it would be intervening in relation to Cuadrilla's applications to Lancashire County Council (the Council). The Council was given notice by letter that the Secretary of State will determine Cuadrilla's appeals against the Council's decision to refuse applications to drill and test fracking at sites at Little Plumpton off Preston New Road and at Roseacre Wood.

Gibbs: government intervention will give the industry greater confidence that they have a potentially more timely route to decision

The government policy paper and current criteria for 'calling-in' planning applications and 'recovering appeals' will no doubt have an impact on shale gas development.

A planning application can be called-in by the Secretary of State at any time up to the granting of planning permission for his own determination and as such take it out of the control of the Local Planning Authority (LPA). The Secretary of State may give directions requiring applications for planning permission, or for the approval of any local planning authority required under a development order, to be referred to him instead of being dealt with by LPAs.

In addition, it is also possible for the Secretary of State to delay the grant of planning permission until he/she has decided whether or not to call-in an application, by what is sometimes called a holding direction. If a planning application is called-in, there will be a public inquiry followed by a report to the Secretary of State, who takes the final decision.

The UK government has made it clear that the Secretary of State will actively consider calling-in shale applications. Each case will be considered on its individual merits in line with his policy. Priority will be given to any called-in planning applications.

A planning application can be called-in at any time up to the granting of planning permission. The power for the Secretary of State to call-in a planning application for his own determination and as such take it out of the control of the LPA is set out in section 77 of the Town and Country Planning Act 1990 (TCPA).

In addition, it is possible for the Secretary of State to delay the grant of planning permission until he has decided whether or not to call-in an application, by what is sometimes called a holding direction. If a planning application is called-in, there will be a public inquiry followed by a report to the Secretary of State, who takes the final decision.

A list of instances when the Secretary of State might decide to use call-in powers are known as the 'Caborn principles' (after the name of the relevant Minister) and may include, for example, those which in the Secretary of State's opinion: may conflict with national policies on important matters; may have significant long-term impact on economic growth and meeting housing needs across a wider area than a single local authority; could have significant effects beyond their immediate locality; give rise to substantial cross-boundary or national controversy; raise significant architectural and urban design issues; or may involve the interests of national security or of foreign governments.

In relation to certain types of applications there is a separate and distinct requirement that the Secretary of State must be notified. The Town and Country Planning (Consultation) (England) Direction 2009 sets out the types of applications that must be notified and the arrangements for consulting the Secretary of State once the LPA has resolved to grant planning permission for the types of development set out in the Direction, including development in the Green Belt. The Secretary of State then has 21 days from that date in which to decide whether or not to call-in the application.

Clearly, the Secretary of State will be aware of applications of which he must be notified. However, the call-in power itself is very wide and as the Caborn principles illustrate are wide enough so that each case may be considered on its individual merits by the Secretary of State.

Under the new plans set out in the August 2015 Policy Paper, for a period of two years the Secretary of State for Communities and Local Government will have the power to 'recover' a planning appeal relating to exploring and developing shale gas. A 'recovered inquiry' is essentially a planning appeal (against a local authority's decision) which the Secretary of State can decide to determine himself, rather than allowing a Planning Inspector to take the final decision.

On a recovered appeal the Planning Inspector will write a report for the Secretary of State, which will make a recommendation on how the appeal should be determined. The Secretary of State will then take the final decision on the appeal. Recovery of an appeal can occur at any stage of the appeal process, even following an inquiry being held, but it cannot be done after the Inspector has issued his or her decision.

The Secretary of State has wide discretion around when to recover an appeal. This is usually carried out either because the development is of strategic importance or has significant implications for national policy or raises novel issues.

The August 2015 Policy Paper also states that the government is committed to identifying underperforming LPAs that "repeatedly fail" to determine oil and gas applications within the statutory timeframes. The statutory timeframe for an application that requires environmental assessment is 16 weeks. When such applications are made to underperforming LPAs, the Secretary of State will consider whether he should determine the application instead. The call-in criteria as they stand would already allow the Secretary of State to do so.

The August 2015 Policy Paper also states that appeals against any refusals of planning permission for exploring and developing shale gas, or against non-determination, will be treated as a priority for urgent resolution. The Secretary of State may also want to give particular scrutiny to these appeals.

Following the publication of the August 2015 Policy Paper it was clear that there would be an increased prospect that applications for shale development would be called in by the Secretary of State for his own decision and that there would be a prioritisation of appeals.

The August 2015 Policy Paper was published shortly after Lancashire County Council rejected Cuadrilla's application for fracking at two sites in the local authority area. It was not long before the government acted again, and in line with the August policy. The inquiry to determine four linked appeals relating to Cuadrilla's planned operations in Lancashire is due to take place in February 2016. This intervention will now mean that the planning Inspector, instead of taking the decision, will prepare a report and recommendation to the Secretary of State who will take the final decision.

This decisive intervention will give the industry greater confidence that they have a potentially more timely route to decision.

The Conservative Party is eager to take advantage of the resource in the UK, believing that exploring and developing its shale gas and oil resources could potentially bring substantial benefits as well as help the UK meet its objectives for secure energy supplies and economic growth. This has been seen in the US, where the rapid expansion of shale exploration is widely credited with the significant reduction in the costs of domestic energy.

The Committee for Climate Change's June 2015 report suggests development of some shale gas capacity is compatible with the government's carbon budgets. However experts observe that it is too early to say whether domestic production of shale gas could result in cheaper gas prices in the UK, noting differences in geology, public attitudes, regulations and technological uncertainties between the US and the UK.

It is evident that local communities need to be convinced of the benefits, but the UK government clearly has no doubts and is driving this development forward at pace. The UK's progress in this field could yet be the catalyst for further development in some parts of Europe taking advantage of the latest technology, best practices, and regulatory oversight being developed in the UK.

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Doing everything smart

Smart cities are becoming a reality. A group of journalists were recently shown around Aspern, a development on the outskirts of Vienna that is seen as a "living lab" or "test bed" for conducting research and validating energy efficient technologies and distribution grid solutions.

Junior Isles reports.

A 240 ha site, formerly used as a military airport on the northeastern outskirts of Vienna, Austria, is now the home of one of Europe's biggest urban development projects. Known as Aspern, Vienna's urban lakeside, the vision for the project is the implementation and optimisation of a future-proof urban energy system.

Since its inception in 2013, significant progress has been made. Already, it includes approximately 3420 apartments, part of a school campus, dormitories, and a research centre for the analysis of advanced manufacturing technologies. By 2028 it will have around 10 500 apartments, a commercial campus and around 20 000 residents.

The project is the brainchild of the City of Vienna, the city's utility companies (Wien Energie and Wiener Netze), and Siemens – the only industrial partner involved in the project. The partners founded a research company called Aspern Smart City Research (ASCR) in 2013 as a joint venture to handle the near €40 million project.

A coordinated research plan driven by Siemens Corporate Technology and its Energy Management and Building Technologies divisions calls for the city to be a 'test bed' or 'living lab' for the integration of technologies that support energy efficiency and sustainable urban development.

Commenting on the project during a recent press visit, Thomas Irschik, Managing Director, Wien Energie, said: "With about 6500 residents, the whole development is about one quarter built. It will be halfway complete by around 2017/18, so the smart city is becoming a reality."

According to the joint venture partners, ASCR "covers everything smart", including smart buildings, smart grids, smart users, smart ICT, smart energy production, smart storage. When considering the technologies needed in this urban development, Siemens said it had to find a way to "mirror the changing energy landscape".

Dr. George Pammer, Managing Director, ASCR, noted: "It was not possible to do it for the whole city, so we had to define test beds for the development of our solutions – test beds that reflect non-conventional energy production and consumption. The challenge was to coordinate the areas of research with the users and the areas they are in."

Siemens is looking to combine different sorts of users – in both working and living areas. The programme for users in living areas is already well under way. The part of the development related to users in the work environment is expected to come in the next phase.

Current research and validation is focusing on a handful of key areas: smart buildings, smart grid and smart ICT (information and communication technology).

In addition to optimising energy use in buildings, which will lead to reduced CO_2 footprint, research is focused on the potential of buildings to flexibly generate energy for the grid. Two buildings, equipped with conventional technology, are being used to provide a benchmark for the research.

This part of the research is aimed at finding control and regulatory mechanisms that optimise both energy costs and the demand for energy. The programme therefore takes into consideration: forecasts for both independent generation and independent energy demand (weather-dependent); energy prices, which vary over time and marketing of the existing level of flexibility.

The technologies to achieve this are currently being tested through the use of three buildings, a new smart grid and a solution for managing the big data.

The first building is a student lodging housing 300 students, which is the test bed for solar photovoltaics (250 kW), a battery (120 kWh) and electrical heating cartridges (hot water, two x 8 kW). The second is a residential building with 213 apartments that features seven different heat pumps (800 kW), hybrid panels for solar-thermal generation (75 kW) and PV (110 kW), geothermal heat accumulators, hot water accumulators, a battery (20 kWh) and apartment automation. The third building is a school with kindergarten, which is testing two heat pumps (510 kW), solar PV (29 kW), solar-thermal generation (90 kW), and electrical hot water preparation (70 kW).

Data from the buildings, covering parameters such as power consumption, air quality and room temperature, is collected and linked with data from the power grid, as well as real-time weather and public event-related information. This is made possible by the new smart grid, which consists of 12 transformer stations with 23 transformers, 500 smart meters and around 100 sensors for the low-voltage grid.

Eventually, all of the data generated by the systems will flow into a City Data Centre. By analysing the most efficient mixes of technologies and their influence on end-user behaviour, it is hoped that the ASCR programme will shed light on how the various systems can be used to optimise a wide range of services.

The next phase of the project considers the smart user, i.e. the occupant of a smart building, who defines environmental conditions (e.g. room temperature) for their living space in line with individual requirements. The smart user will be given the ability to set and control certain parameters through an app on a smartphone or tablet. They will also be informed of their consumption, so they have the option of changing their behaviour. This next step is being planned to start during the summer of 2016.

At this point Aspern will be well on the way to becoming a valuable reference for "everything smart" – a preview of the future and how cities, utilities and industry stakeholders can address the challenges of the changing energy landscape.

Looking to the future

In a press event on the sidelines of European Utility Week in November, Siemens presented future scenarios for Europe's power supply grid and how digitalisation revolutionises the grid.

Forecasting the EU generation mix in 2030, Siemens predicts that more than 40 per cent of the installed fleet will consist of wind and solar photovoltaic plants.

This change in the energy landscape is presenting tremendous challenges for the electricity grid and utilities.

Professor Dr Michael Weinhold, CTO, Siemens Energy Management Division noted: "The system dynamics will change as we go along. There will be more in-feed from wind and PV via power electronics, as opposed to rotating mass from traditional generators. When we talk about the change in how we produce electricity, we also have to consider the different business models behind it."

Siemens says there will be an even greater need for digitalisation as a way of managing the change and resulting challenges.

"We will see the need for more precise energy-weather forecasts and to react if there's a deviation from the forecasts. Stakeholders will prepare for different scenarios. For example, grid operators will develop more dynamic stability assessment tools," said Dr Weinhold

Siemens has been pushing its digitalisation strategy across the value chain, launching its Digital Grid Business Unit on October 1, 2015. Thomas Zimmermann, CEO, Siemens Digital Grid, said: "Digitalisation is a very hot topic in the area of energy management. The new business unit combines our Energy Automation business with the software part of the smart grids solutions and services business. From our point of view, automation is the first step of digitalisation."

Siemens' digitalisation strategy includes pushing 'vertical software' – for meter data management, analytics applications, load monitoring and grid control – as well as digital services, e.g. for smart meter managed services and distributed energy systems.

This, says, Zimmermann is not "just a concept or plan, it's a reality today". In addition to the Aspern smart city project, another example he gave is a central data hub, or Market Transaction Management system, installed for Statnett, Norway.

The Market Transaction Manager is designed to manage aggregation, change tracking, and the delivery of meter reads data for the purpose of enabling settlement transactions of a whole market. With this application, the operator can give market participants – DSO, TSO, power generation companies, renewable power resources owners, retailers, end users, third parties, and prosumers – access to meter reads data and aggregated usage data, analyse grid loss data, and exception processing through a single interface.

Weinhold: The system dynamics will change as we go along

Junior Isles

The glass is half full

Generally there are two types of people – those that see the glass as half full and those who see it as half empty. Following the recent agreement on climate change at the United Nations COP21 climate summit in Paris, the latter were few and far between. While negotiators raised glasses to toast their achievement, surprisingly there was little evidence of others crying into their beer.

Following the deal, which was eventually signed after the conference was extended by a day, UN Secretary-General Ban Ki-moon said: "History will remember this day... The Paris agreement on climate change is a monumental success for the planet and its people."

French Foreign Minister and President of the COP21 conference Laurent Fabius, also praised the deal, calling it a "historical turning point" that could help the world avoid catastrophic effects of climate change.

Certainly there were reasons to be cheerful. Signed by nearly 200 countries, it is the first ever agreement with the global support of both developed and developing nations to cut GHG emissions.

Among the key measures in the Paris Agreement, global leaders have agreed to: peak GHG emissions as soon as possible; keep global temperature increase "well below" 2°C and pursue efforts to limit it to 1.5°C; review progress (upwards) every five years and $100 billion a year in climate finance for developing countries by 2020, with a commitment to further finance in the future.

On paper, the ambition is there. But action speaks louder than words and there remains much to be done if the prime goal of actually limiting the global temperature increase is to actually be achieved.

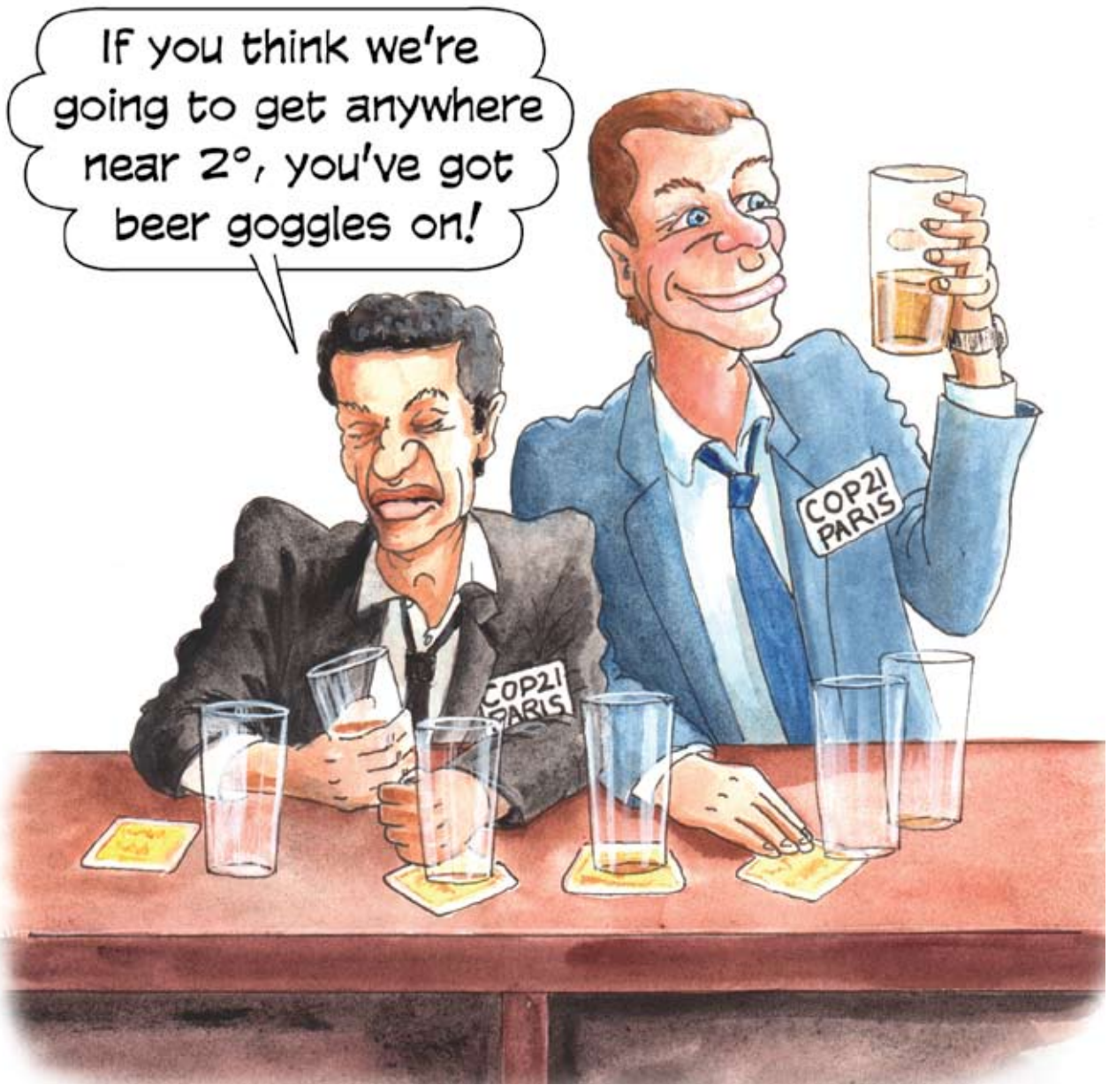
Intended Nationally Determined Contributions (INDCs) submitted ahead of the summit being insufficient to get the world on a 2°C trajectory, no one is losing their head simply because an agreement has been signed.

Daniel Mittler, Political Director of Greenpeace International wrote in a blog post: "We already know that the pledges governments made to Paris are not good enough... The Paris agreement does not force governments to change and change fast."

> "We welcome the agreement in Paris and that we have a vision for the future. Now, the challenge is to turn words into measurable actions at both national and regional levels and to close the remaining ambition gap."

Reacting to the deal, Christoph Frei, Secretary General of the World Energy Council, said: "We welcome the agreement in Paris and that we have a vision for the future. Now, the challenge is to turn words into measurable actions at both national and regional levels and to close the remaining ambition gap."

With calculations showing that the Intended Nationally Determined Contributions (INDCs) submitted ahead of the summit being insufficient to get the world on a 2°C trajectory, no one is losing their head simply because an agreement has been signed.



If anyone was expected to be seen crying into their beer, it would be Greenpeace. Yet even they appeared less disgruntled than usual in voicing criticism of the global climate change effort.

"All in all, governments took us a step forward in Paris," wrote Mittler, "The key issue is not what is in this deal but what will happen next. And that is why I am optimistic."

Perhaps the reason for the almost universal optimism is perhaps more to do with expectations than anything else. As one columnist in *the Guardian* newspaper put it: "By comparison to what it could have been, it's a miracle. By comparison to what it should have been, it's a disaster."

At a recent London conference organised by the Energy Technology Institute (ETI), held under the Chatham House Rule, one participant said: "The deal is not perfect but it was the best we could hope for."

Still, we should take what we can get and remain positive. No one was expecting a legally binding agreement but at least we have a public commitment that has global support from nearly 200 governments. Countries are now under huge political pressure to deliver on their commitments, which should lead to acceleration and widening of low carbon plans.

But make no mistake, to get to those commitments will be hard. To get to 2°C above pre-industrial levels will be even harder, let alone 1.5°C.

All the tools available will be necessary. For those countries that persist with fossil fuels, carbon capture and storage will be needed and conventional coal fired plant will have to be replaced with supercritical technology. The rapid transition to renewables will have to continue and nuclear will be needed. At the same time, energy efficiency, demand side response and better use of existing generation assets through more interconnection must not be forgotten.

Market-based mechanisms have a key role to play in driving the transition, a point recognised in Paris. Notably, the agreement includes two key elements that are important for the development of an international carbon market: the use of internationally transferred mitigation outcomes by parties and establishment of a mechanism for mitigation and sustainable development.

Yann Andreassen, Senior Analyst EU carbon markets at ICIS Tschach Solutions, said: "These two elements enable the Paris Agreement to create a framework for international carbon trading under the UNFCCC umbrella. This will allow parties to use international market mechanisms in order to fulfil their INDCs."

To an extent, the Paris agreement could also play a facilitative role in linking emissions trading systems around the world. Andreassen noted: "Linking carbon markets doesn't require an international agreement like Paris to materialise. However, the potential convergence of accounting practices to emerge from the agreement could be an important step forward, as environmental integrity is a critical element for linking carbon markets.

"Furthermore, the use of internationally transferred mitigation outcomes will help integrate mitigation actions, like an emissions trading system, under the international framework".

The recognition of the role of carbon markets was particularly welcomed by Europe's power industry. Hans ten Berge, Secretary General of Eurelectric, the voice of Europe's electric utility sector said: "In particular, we strongly welcome the inclusion of positive provisions recognising the important role of markets in achieving the global low carbon transition. We believe that market-based mechanisms, such as carbon markets, are the most effective tool for mitigating greenhouse gas emissions and stimulating investments in low carbon technologies and energy efficiency."

For all its positives, the Paris Agreement leaves a number of risks. Apart from the INDCs not adding up to 2°C, targets are not mandatory and there are no clearly defined consequences for failing to reach them. Further, there is still no universal carbon price – something many believe to be essential if the world is to see a transition to a low carbon economy.

The COP21 agreement is not a legally binding agreement but is more of a toolbox; now there is a system and process in place for moving things forward. As one participant at the ETI conference noted: "We can now have a global 'stock-take' every five years. The ratchet mechanism will keep moving things forward and help to bend the trend."

Globally, the low carbon race is well and truly on. If nothing else, the Paris Agreement will inspire all stakeholders to do more as a result of this public showing that we are all in it together and aspire to a common goal.

Instilling a sense of responsibility and ownership often delivers greater success than trying to use binding agreements to achieve goals. A firm but gentle pull of a horse is often met with less resistance than an aggressive push.

Taking this approach to climate change provides no guarantees but might result in countries going even further than they would otherwise have been required. With continuous monitoring and reporting, we will soon see whether it is working. COP21 has not solved our problems but the agreement gives reasons to be hopeful. The glass is half full.