THE ENERGY INDUSTRY TIMES

August 2015 • Volume 8 • No 6 • Published monthly • ISSN 1757-7365 www.teitimes.com

Superconducting transition

Superconductors could help drive the energy transition, hears *TEI Times* at a roundtable in London. ***Page 13***

Storing up innovation

Fostering innovation in areas such as storage has a key role to play in meeting global decarbonisation goals. ***Page 14***

Final Word

Fifty shades of grey hits the UK, says Junior Isles. ***Page 16***

News In Brief

Offshore wind costs continue to fall
The cost of electricity from offshore wind farms beginning construction in 2020 could be competitive with gas and nuclear plants.
Page 2

Clean power battle looms
US states are squaring up to battle President Barack Obama on his Clean Power Plan following his Administration's failed attempt to impose stricter rules on mercury.
Page 4

China's emissions pledge typifies clean-up efforts
China's Intended Nationally Determined Contributions (INDC) are further evidence of the country's concrete efforts to tackle climate change and clean up its energy sector.
Page 6

UK contracts spare capacity as winter margins fall
The rationale of capacity mechanisms is being questioned as National Grid procures spare supplies in the face of a dwindling reserve margin.
Page 7

Alstom, GE attempt to ease EU Commission concerns
Alstom and GE are making concessions in an attempt to gain approval from the EU Commission for GE's deal to buy a large part of Alstom's power business.
Page 9

Fuel Watch: Europe moves to connect missing gas links
Motivated primarily by a desire to reduce dependence on Russian gas, the EU is taking steps to assure the bloc and its neighbouring states of steady gas supplies.
Page 11

Technology: Europe's circular economy in action
Research shows that green energy and nutrient recovery provide powerful incentives to explore and commercialise innovative solutions for processing and converting Europe's sludge and slurry mountain.
Page 15

EU progresses Energy Union strategy

Šefčovič: giving consumers a central role in Europe's energy transition

A balanced consideration of the consumer, security of supply and sustainability objectives in the European Commission's "Summer Package" has been largely welcomed by industry.
Junior Isles

As part of the Energy Union strategy, the European Commission has presented proposals to deliver a new deal for energy consumers to update energy efficiency labelling, revise the EU Emissions Trading System (ETS) and launch a redesign of the European electricity market.

The proposals give prominence to the 'energy efficiency first' principle and put households and business consumers at the heart of the European energy market.

Maroš Šefčovič, EU Commission Vice-President for Energy Union, said: "In the Energy Union strategy, we committed to empowering European consumers, creating a single well-functioning energy market, putting energy efficiency first and becoming the number one in renewables. Today, five months after the adoption of the Energy Union strategy, this Summer Package shows our determination to decarbonise our economy and to give consumers a central role in Europe's energy transition. It marks not only a new deal for consumers, but a new deal for Europe's entire energy system."

Although the European Commission has praised a more integrated approach to the energy system, some argue that the interaction of the heat and electricity sectors remains unaddressed in the Summer Package.

With heating and cooling in buildings and industry representing the EU's biggest energy end-use sectors (46 per cent) and with more than half of primary energy consumed in power-only plants lost in the form of heat, COGEN Europe says the implementation of the Energy Union must highlight and tackle interactions between different sectors of the economy.

Fiona Riddoch, COGEN Europe Managing Director said: "There are important efficiency gains to be made from considering the heat and electricity sectors together particularly in the recovery of heat and operational aspects of the electricity networks. Even though it aims to put 'energy efficiency first' the package does not acknowledge this in its sections on customers and electricity market design review."

The package is seen as an important step towards implementing the Energy Union strategy with a forward looking climate change policy, launched as one of the political priorities of the Juncker Commission in February 2015.

The Commission revised the ETS,

Continued on Page 2

Cutting UK renewable support will "drive away" investment

The UK's decision to cut support of renewable energy could adversely affect investment in the sector, say industry observers.

In late July the Department of Energy & Climate Change (DECC) announced measures to deal with a projected over-allocation of renewable energy subsidies. According to DECC the revised subsidies will ensure consumers are protected from higher energy bills.

In a statement, it said: "Reducing energy bills for hard working British families and businesses and meeting climate goals in the most cost effective way are government priorities."

Announcing the changes to bring costs under control, Energy and Climate Change Secretary Amber Rudd said: "Our support has driven down the cost of renewable energy significantly. As costs continue to fall it becomes easier for parts of the renewables industry to survive without subsidies. We're taking action to protect consumers, whilst protecting existing investment."

The measures announced include:

- removing the guaranteed level of subsidy for biomass conversions and co-firing projects for the duration of the Renewable Obligation (RO), known as grandfathering;
- launching a consultation on controlling subsidies for solar PV of 5 MW and below under the RO. This includes consulting on early closure and removing the guaranteed level of subsidy for the duration of the RO;
- a consultation on changes to the preliminary accreditation rules under the Feed-in Tariff (FIT) scheme followed by a wider review of the scheme to drive significant further savings.

The government will also set out its plans in the autumn in respect of future Contracts for Difference (CFD) allocation rounds. Totals for the Levy Control Framework (LCF) beyond 2020, providing a basis for electricity investment into the next decade, will also be set out.

Michael Grubb, Professor of International Energy and Climate Change Policy at University College London, says that announcements over the past few weeks were retrospective changes that inject uncertainty and drive away investment in the energy sector.

Former Shell Chairman Lord Oxburgh of Liverpool noted that constant changes to policy increased costs. He said: "The changes that the government is announcing in the name of affordability will have the perverse effect of increasing the cost of clean energy. Constant changes to energy policy undermine investor confidence and increase the cost of capital for renewable energy projects."

Rhian Kelly, CBI Business Environment Director, said: "Ensuring consumers' bills remain affordable is rightly a priority for the government, but it must work with industry in order to provide consumers with long-term value.

"That means getting the policy right from the outset, and having in place a clear and transparent framework to give investors the certainty they need."

In early July the Chancellor George Osborne announced in his budget speech that he is retrospectively changing the rules governing the Climate Change Levy – a measure introduced in 2001 with the aim of improving energy efficiency and increasing demand for renewable energy.

Osborne said the exemption would be removed from August 1 but there will be a transitional period for suppliers to claim the exemption on any renewable electricity that was generated before that date.

According to ICIS the decision will hit UK generators such as wind farms and biomass power plants to the tune of £5.54/MWh ($8.58/MWh) produced. This is approximately 5 per cent of income for an onshore wind farm owner, based on today's electricity prices and subsidy arrangements it said.

The Chancellor calculates the removal of the exemption will earn the Treasury £450 million in 2015/16, rising to £910 million in 2020/21.

In June, the government said it would scrap the RO, which is the primary of three subsidies for onshore wind farms, claiming the country has enough onshore wind in the pipeline.

Continued from Page 1

which represents the first legislative step towards implementing the EU's commitment to reducing greenhouse gas emissions by at least 40 per cent domestically by 2030.

Carbon markets analyst ICIS Tschach said the ETS Directive reform is generally in line with market expectations but is just the beginning.

Jan Ahrens, Director Market Analysis, ICIS Tschach commented: "The proposal marks just a start of a process. I expect to conclude earliest in the second half of 2016, if not 2017. I expect that in particular the rules around benchmarks and carbon-leakage exposure will be the focus of discussions."

Apart from strengthening the annual reduction of allowances and creating funds to support innovation and modernisation, the reform redistributes allowances from less carbon leakage exposed companies to the ones deemed highly exposed to international trade.

"Interestingly, the new definition does not take into account any more the actual carbon allowance price in the EU, but only focuses on trade intensity with countries outside the EU ETS and the carbon intensity measured in $kgCO_2/€$ produced," said Ahrens. "The new formula also does now omit if other nations have implemented similar carbon regulations like the EU ETS.

"Generally, this rule change will leave more companies short of allowances, which could lead to stock building in the coming years and thus support prices slightly," he added.

Eurelectric, the organisation representing Europe's electric utilities also welcomed the publication of the proposal to strengthen the EU ETS.

"Together with the recent agreement to establish a Market Stability Reserve, we believe that these reforms will enable the EU ETS to provide incentives to reduce greenhouse gas emissions, improve energy efficiency and to invest in low carbon technologies, provided that such reforms contribute to setting a clear, consistent and credible carbon price signal," said Eurelectric Secretary General Hans ten Berge.

According to the Commission, a fundamental transformation of Europe's electricity system including the redesign of the electricity market is required if the Energy Union strategy is to deliver its goals.

A Public Consultation period has been launched on what the new electricity market design should look like in order to meet consumers' expectations, deliver real benefits from new technology, facilitate investments, notably in renewables and low carbon generation; and recognise the interdependence of European Member States when it comes to energy security.

European Distribution System Operators for Smart Grids (EDSO) said the package recognises the need to adapt to new realities by making the most of flexible demand and generation as well as smart technologies in a way that "empowers citizens to take ownership of the energy transition".

"The Package represents strong efforts towards designing a new market where price incentives simultaneously reward the active participation of consumers, encourage sustainability through energy efficiency and the uptake of RES and self-consumption, send the right signals to investors, all while very importantly ensuring that grid operators are able to cost-efficiently guarantee a stable supply," said EDSO Secretary General, Ana Aguado.

Offshore wind costs continue to fall

The cost of electricity from offshore wind farms beginning construction in 2020 could be competitive with gas and nuclear plants. **Junior Isles** reports

Offshore wind projects going into construction in 2020 could deliver clean power at a cost that is lower than that delivered by new gas fired power plants, according to a report from consultancy BVG Associated commissioned by renewable energy developer Statkraft.

"Real, tangible advances in technology, the supply chain, and policy have combined to drive down the cost of energy for projects about to go into construction in 2015," the report states. "This downward pressure is expected to continue, with offshore wind projects going into construction in five years that are competitive with new CCGT (combined cycle gas turbine) plant."

The report says offshore wind could comfortably beat the £100/MWh goal as turbines grow in size.

Ever-larger turbines are being deployed offshore. At the start of July Siemens, the top offshore wind turbine supplier, officially inaugurated the Westermost Rough wind farm. Consisting of 35 Siemens wind turbines, each with a capacity of 6 MW and a rotor diameter of 154 m, this project is the first to use these turbines on a large scale in a commercial project.

In addition to bigger turbines, Siemens says lowering the cost of servicing will also contribute to lower cost of energy from offshore wind.

In June, together with government and community officials, customers and special guests, the company christened the first two purpose-built Service Operation Vessels (SOV) in Germany. The christening events took place in cooperation with Esvagt A/S, owner of the two vessels.

The 'Esvagt Froude' was the first to be formally christened on June 23 in Rostock and is supporting service and maintenance operations at EnBW's Baltic II wind farm in the Baltic Sea. On June 25, the 'Esvagt Faraday' was christened in Hamburg and will be deployed for service of wpd's Butendiek wind farm in the North Sea.

"Wind energy is going to represent a substantial part of the new electricity sources that will come on line in the near and mid-term future. Siemens is committed to pioneering new technologies and new service strategies that make the lifecycle cost of wind energy competitive," said Randy Zwirn, CEO of Siemens Power Generation Services. "One of the ways we accomplish this is with these new SOVs that are a key part of our offshore service logistics for providing accurate, efficient and safe offshore wind service."

Stable government policy is also seen as a factor in lowering costs, especially in the UK, the world's leading market for offshore wind.

Addressing the Renewable UK Global Offshore Wind Conference in London in late June, Keith Anderson, CEO of ScottishPower Renewables, said: "The good news is that costs are already coming down. For example our East Anglia One project has seen costs reduce sharply and we secured a contract for difference at under £120 per MWh recently."

The first two purpose-built SOVs were christened in Germany in June. The photo shows a ship on an assignment at the offshore wind power plant Borkum Riffgrund in the German North Sea

He added: "In this sector, to deliver cost reductions and wider economic benefits, we need stability of government policy."

Also speaking at the conference, UK Energy and Climate Change Secretary Amber Rudd commended the progress made in offshore wind in the past 15 years, noting that installed capacity has quadrupled since 2010 to 5 GW.

Rudd committed to three steps to help "build on that success", including further investment and deployment of offshore wind farms to "maintain our world leading status", bringing costs down to make it more competitive and "subsidy-free" and to ensure the economic benefits improve for companies involved in offshore wind.

RenewableUK, the trade association representing the wind and marine energy industries, has published a new document, which makes a case to Government to continue its support for offshore wind, outlining specific actions that Ministers could take to ensure expansion.

The report highlights a series of key achievements, noting that the industry has reduced costs by 11 per cent in the last five years and is on target to drive costs down to £100/MWh by 2020. It says offshore wind is set to be cost-competitive with new nuclear by the mid-2020s.

Tensions ease over Middle East nuclear

France and Saudi Arabia are pressing ahead with feasibility studies to build two Areva-designed EPR nuclear reactors as the two countries strengthen business ties amid tensions across the region.

The reactor feasibility studies could signal an opening of the Saudi market for the struggling French nuclear group Areva.

"We have enabled our partnership to take a significant step forward," a senior French diplomat said, adding that France was the first country to sign such an agreement with the kingdom.

Saudi Arabia also recently signed a nuclear waste disposal contract and a nuclear safety accord.

The news came just ahead of the announcement that Iran and the so-called P5+1 (US, UK, France, China and Russia plus Germany) had reached an agreement on the long-running dispute over Iran's nuclear programme.

Fear that Iran has been enriching uranium for the purpose of building nuclear weapons has seen sanctions imposed on Iran. Iran insists that its nuclear programme is entirely peaceful.

Under the deal, Iran will maintain the ability to enrich uranium but only for peaceful purposes. For 15 years, it agreed to refine the metal to no more than 5 per cent enrichment, the level needed to fuel nuclear power plants. Iran also agreed to give International Atomic Energy Agency (IAEA) inspectors access to its known nuclear sites.

US lawmakers have until mid-September to consider the pact, and then vote to approve or disapprove it or take no action. If it passes Congress, it will be formally adopted in mid-October.

The resolution says, however, that no sanctions will be lifted until the IAEA submits a report verifying that Iran has implemented the measures outlined in the Joint Comprehensive Plan of Action (JCPOA).

Nuclear proliferation in the region has been a concern to the West. In a separate announcement the IAEA says it is still studying Syria's request for assistance in converting its research reactor to run on low-enriched uranium (LEU) fuel and shipping its highly enriched uranium (HEU) out of the country.

Syria operates a Miniature Neutron Source Reactor near Damascus for research purposes. The reactor runs on about 1 kg of HEU. According to the IAEA, about 25 kg of HEU are necessary for a nuclear weapon.

The Syrian reactor is under IAEA safeguards but in June 2013, due to deteriorating security conditions because of the civil war in Syria, the agency suspended its physical verification of the reactor. Syria invited IAEA inspectors back in February and May 2014 but the agency said in its September 2014 report on the implementation of Syria's safeguards agreement that the agency cannot send inspectors into the country because of the security situation.

Meanwhile, the UAE's nuclear energy programme, which has been held up by the industry worldwide as a model for newcomers keen to develop nuclear energy for peaceful purposes, is facing its biggest challenges in the run-in to its first reactor's start-up, scheduled for late 2017.

Although the first reactor at the Barakah site in Abu Dhabi's remote western region is nearly 75 per cent complete and is on time and on budget, industry executives say the last phase will be the toughest.

Austrian challenge to Hinkley Point C "undermines right of energy choice"

Austria's decision to formally submit its threatened legal challenge against the British government's plans to subsidise the proposed new Hinkley Point C nuclear power station in Somerset, UK, has been criticised by the World Nuclear Association.

Austria's says its action challenges the legality of the subsidy agreed for Hinkley C, as approved by the EU Commission. However, media statements from Austrian officials say the action is being pursued because of Austria's anti-nuclear stance.

In response to the action launched in early July, Agneta Rising Director General of the World Nuclear Association said: "It is one thing to have an opinion, it is quite another to try and force your opinion on someone else.

"The UK public, indeed people in all countries, have the right to choose nuclear to meet their energy needs and to help address climate concerns if they so wish. It is a pity that the Austrian government has decided not to respect that right."

"The countries that are leading on decarbonisation are using nuclear energy. Not all countries are in Austria's position - lucky enough to be able to count on hydropower built decades ago to provide roughly 65 per cent of their electricity today. Most others have to make pragmatic choices," continued Rising.

Wind Act will boost US offshore wind

US offshore wind finally looks set to take off as lawmakers introduce a bill that should give the industry the certainty needed to plan investments and maximise technology deployment.

Siân Crampsie

A bipartisan bill has been introduced by US lawmakers to provide financial incentives for the development of offshore wind energy.

Senators Tom Carper (D-Del.) and Susan Collins (R-Maine) have introduced the Incentivizing Offshore Wind Power Act, which would create an investment tax credit redeemable for the first 3000 MW of offshore wind facilities placed into service.

The bill was introduced as construction on the USA's first offshore wind farm got under way at Block Island off the coast of Rhode Island.

Developer of the project, Deepwater Wind, said in mid-July that the main installation vessel, the Weeks 533, was mobilised for work following the arrival of the wind turbine foundations at the construction site.

The Incentivizing Offshore Wind Power Act would give the industry the certainty needed to plan investments and maximise technology deployment, said Sen. Carper. "Senator Collins and I have introduced this bill to help create the nurturing environment the industry needs to grow and thrive.

"Instead of yearly extensions of the investment tax credit that fall short, a credit for the first actors will encourage private sector development of offshore wind facilities across the country and help move the United States closer to energy independence."

"This bipartisan legislation will help catalyze the offshore wind industry and create jobs in the United States," Sen. Collins said. "This proposal will help give private sector companies the tax certainty they need to develop this industry in America past its infancy and create a new sustainable source of domestic power."

The legislation defines offshore facilities as any facility located in the inland navigable waters of the United States, including the Great Lakes, or in the coastal waters of the United States, including the territorial seas of the United States, the exclusive economic zone of United States, and the outer Continental Shelf of the United States.

At the beginning of July, the first foundations for the Block Island wind farm were loaded onto a barge and sent from Louisiana, where they were constructed by Gulf Island Fabrication. They will be installed over eight weeks this summer.

Block Island is due to be commissioned in the autumn of 2016.

Mexico details energy tenders

Mexico is hoping to boost its power generation capabilities with the import of cheap natural gas from the USA.

The country says it will tender 24 projects to improve the capacity of its pipelines, power plants and distribution networks. The tenders are worth almost $10 billion combined.

The plans include nine electricity distribution projects and four power generation projects, including wind parks, combined cycle power plants and geothermal projects.

In June national electricity company CFE agreed with Spanish firm Iberdrola to develop jointly several energy projects in Mexico.

The two companies are aiming to cooperate on power plant refurbishment, optimising the use of natural gas resources, and finding competitive solutions for energy storage.

The joint agreement provides for the preferential supply of natural gas to Iberdrola from the CFE in new projects as well as the joint management of upcoming contracts. Also, Iberdrola is studying the feasibility of constructing several combined cycle/cogeneration power projects that would create more than 3000 MW of new capacity.

The projects under discussion include the Tamazunchale II combined cycle power plant, as well as the development of pumped storage hydroelectric power plants.

City lights: Mexico is boosting power capacity with the help of cheap gas from the US

Enel grows green energy in Chile

Enel Green Power (EGP) is to cement its foothold in Chile's rapidly growing renewable energy market with a deal to build three new power plants.

EGP's Chilean subsidiary has signed a power purchase agreement with Empresa Nacional de Electricidad (Endesa Chile) covering a solar photovoltaic (PV) plant, a wind farm and a geothermal power plant.

The 25-year power purchase agreement is worth around $3.5 billion while the three power plants will require total investments of $800 million and will have a combined output of 300 MW.

Separately, EGP said it has started construction of the 160 MW Finis Terrae solar PV power plant and the 24 MW Los Buenos Aires wind facility in Chile.

Located in the Antofagasta region, Finis Terrae will be the largest solar PV park in Chile.

EGP will invest about $270 million in the construction of the plant.

On completion of the 300 MW of capacity signed under the latest PPA and another 300 MW EGP is currently executing in Chile, the firm will have an installed capacity of 1.2 GW in the country.

In defiant mood: US President Barack Obama is ready to take on states over Clean Power Plan

Clean power battle looms after mercury ruling

- EPA's mercury plan defeated
- Gas surpasses coal in power generation

Siân Crampsie

US states are squaring up to battle President Barack Obama on his Clean Power Plan following his Administration's failed attempt to impose stricter rules on mercury.

In June the Supreme Court ruled against an Environmental Protection Agency (EPA) regulation limiting mercury and other toxic emissions from power plants under the Clean Air Act.

The EPA interpreted the law "unreasonably" and failed to consider the costs of compliance with the new regulations, the court ruled.

The EPA said that the ruling would not affect the Obama Administration's controversial Clean Power Plan to limit greenhouse gas emissions, which was due to be finalised in July.

Advocates of the Clean Power Plan say that the proposals will cut pollution and add no more than 5 cents a week to average household electric bills. Critics say that it will put thousands of people out of work and force utilities to prematurely shut down more coal-fired power plants.

A new report from sustainability group Ceres says that in the last few years, pollution from the largest electric utilities in the USA has fallen significantly.

It warned, however, that emission rules need to be strengthened in order to achieve a consistent and broad reduction in emissions across all states.

"Most parts of the country are firmly on the path toward a clean energy future, but some states and utilities have a longer way to go and overall the carbon emissions curve is still not bending fast enough," said Mindy Lubber, President of Ceres. "To level the playing field for all utilities, and achieve the broader CO_2 emissions cuts needed to combat climate change, we need final adoption of the Clean Power Plan."

A number of US states have called for the Clean Power Plan to be finalised and implemented in order to create a level playing field for all states and utilities across the country. Others – including Tennessee, Ohio and Nevada, are concerned about the impact of the rules on companies and consumers.

At least five governors have threatened not to comply with the new pollution rules, including those of Texas, Louisiana, Oklahoma, Indiana and Wisconsin. A barrage of legal challenges to the proposals is expected once the rules are finalised.

The plan is widely regarded as the most important environmental rule to affect the power industry, and is expected to change how electricity is generated and consumed in the USA. The goal of the emissions reduction plan is to slash carbon dioxide emissions 30 per cent from 2005 levels by 2030.

States must generate action plans defining how they will achieve the emission reduction targets, and most would have to achieve at least half the required reductions by 2020.

According to Ceres, 42 states decreased their electricity sector CO_2 emissions from 2008 to 2013 by an average of 19 per cent. However, it found uneven performance across the states, with CO_2 emission rates varying ten-fold.

Behind the trend in decreasing emissions is an increase in natural gas in power generation.

According to the Energy Information Administration, natural gas surpassed coal for the first time as the most favoured fuel of US power generators in April.

That month natural gas accounted for 31.5 per cent of power generation, ahead of coal at 30.3 per cent.

The EIA said in March that power companies intend to add 4318 MW of natural gas fired generation capacity this year. That puts natural gas second behind only wind power, of which generators plan to add 9811 MW. As for coal, generators plan to retire 12 922 MW of capacity fuelled by it.

India continues renewable drive

- Loan scheme for rooftop solar
- Contracts imminent for 15 000 MW of solar PV

Syed Ali

India is continuing to provide government support and attract investment as it works towards fulfilling its renewable ambitions, particularly in the solar sector.

Last month the Indian Renewable Energy Development Agency (IREDA) launched a new loan scheme to support rooftop solar power projects across the country.

The scheme will provide loans at an interest rate of 9.9 to 10.75 per cent to system aggregators and developers, depending on the credit rating of the borrower.

The minimum capacity for the application would be 1 MWp for both categories of aggregators and individual developers, with individual projects of capacity not less than 20 kWp.

IREDA has set a target of adding 100 GW of solar power by 2022 with 40 per cent of the total coming from rooftop solar.

As part of the National Democratic Alliance (NDA) government's green energy push, India recently said it plans to award contracts for the supply of 15 000 MW this year. According to the plan, Solar Energy Corp. of India (SECI) will shortly call for bids from developers for buying 2000 MW, a government official said.

India needs as much as $200 billion to meet its 100 GW target.

New and Renewable Energy Secretary Upendra Tripathi said that the government is looking for $2 billion from the World Bank and Asian Development Bank, which would be channelled into banks to help finance projects on low interest rates.

The International Finance Corporation (IFC), the private financing unit of the World Bank also signed a partnership agreement with IREDA to provide infrastructure financing for energy projects in India.

There has been growing interest from overseas investors in the Indian renewable energy space as well. SoftBank Corp., along with Bharti Enterprises Ltd and Taiwan's Foxconn Technology, in June proposed to invest at least $20 billion in solar energy projects in India through a joint venture, SBG Cleantech Ltd.

In mid-July Russia's OAO Rosneft, the world's largest publicly traded oil company, reportedly expressed serious interest in investing in India's solar sector.

According to a local report, an unnamed Indian government official said: "Representatives from Rosneft have met the Indian government officials. They want to set up a capacity ranging between 10 000 MW and 20 000 MW."

The government says it aims to provide solar power at less than Rs.4.50/kWh (US7.03¢/kWh), a target that it is steadily inching towards.

A recent tender will see Madhya Pradesh (MP) get the cheapest solar power in the country. MP Power Management Company opened tenders for the supply of 300 MW of solar power on a 25-year term basis and received bids as low as Rs5.05 per unit.

Mauritius-based SkyPower Southeast Asia Holdings secured rights to develop three projects of 50 MW capacity, each at tariffs ranging from Rs5.051/kWh(7.95¢/kWh)toRs5.298/kWh (8.34¢/kWh).

MP Power's Managing Director, Sanjay Kumar Shukla said: "It is the lowest rate for supply of solar power to-date in the country. At present, the state is getting solar power at the rate of Rs6.50 to Rs7 per unit."

Meanwhile, wind is also picking up speed in a country determined to take advantage of abundant renewable resources.

According to a report by ratings and research firm CRISIL, wind power capacity in India has grown an impressive five-fold in the last 10 years, touching 23 000 MW in March 2015. The report said that India's wind power sector could attract Rs1 lakh crore ($15.6 billion) worth of investments by 2020.

Indonesia geothermal warming up

State-owned oil and gas company Pertamina says it has prepared Rp 33 trillion ($2.5 billion) worth of financing for the development of geothermal electricity plants up to 2019.

Pertamina President Director Dwi Soetjipto said the financing would be used to increase the installed capacity of geothermal electricity plants from 505 MW to 907 MW by 2019.

"We have made geothermal development one of our strategic priorities and we have a blueprint of geothermal development up to 2019," he said during the inauguration of Pertamina's 35 MW Kamojang Unit 5 geothermal power plant by President Joko "Jokowi" Widodo in Garut, West Java, on July 5, 2015.

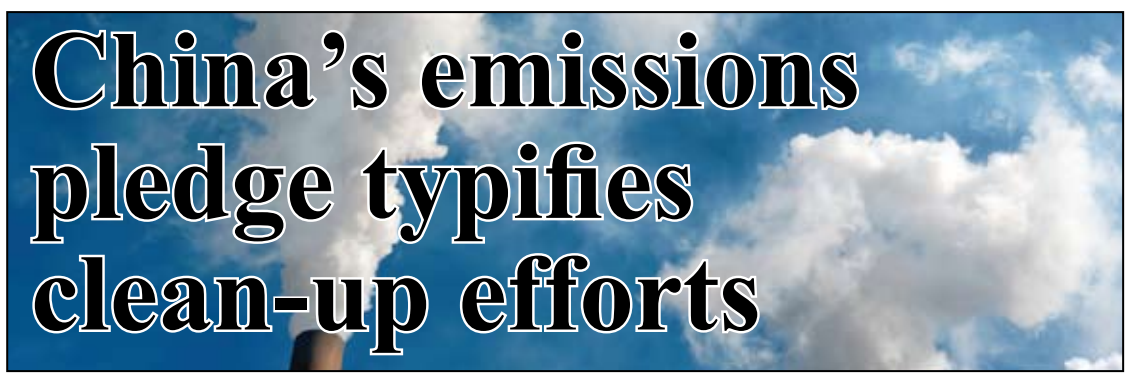
During the inauguration President Jokowi officially announced the construction of six geothermal power plants spread across several provinces.

In his speech, President Jokowi said that the construction of the geothermal plants is part of the government's effort to gradually shift from coal to more environmentally friendly plants.

"Currently, around 90 per cent of the 35 000 MW national energy target relies on coal. Later, there will be thousands of MW of electricity generated from wind, sea waves, sun and biomass power," he said.

The government's ambitious plan to reach its 35 000 MW target in five years had raised concerns among environmental activists, as most of the power plants are coal-based.

- In late June, Lotte Engineering & Construction announced that it won a $230 million project to build a 501 MW gas fired combined cycle power plant 75 km east of Surabaya in East Java.



China's emissions pledge typifies clean-up efforts

China's national climate pledge shows that it is "absolutely serious" about taking the risks of climate change seriously and taking action to mitigate them, says Syed Ali

China's Intended Nationally Determined Contributions (INDC) submitted to the UN at the end of June are further evidence of the country's concrete efforts to tackle climate change and clean up its energy sector.

Former Ambassador to the United Nations Sir Crispin Tickell said that the Chinese INDC confirmed the government's commitment to tackling issues like air pollution.

Scaling up from the 45 per cent goal for 2020, the INDC pledges to cut the carbon emissions/GDP ratio for 2030 by 60-65 per cent over 2005 levels. As the world's top greenhouse gas emitter, China's plans are an important step towards sealing a meaningful global climate deal due to be signed in Paris in December this year.

Commenting on the announcement, former Shell Chairman Lord Oxburgh of Liverpool said: "This pledge by China shows that it is absolutely serious about taking the risks of climate change seriously and taking action to mitigate them. China also tends to be conservative on targets like this, so it seems likely that Chinese emissions will peak before 2030."

Samantha Smith, leader of WWF's Global Climate and Energy Initiative noted that China, as a developing country, has shouldered a significant contribution to reducing carbon pollution.

"This is the first major developing country emitter to set a total emissions peak target," she said.

Under its INDC plan, China says it will increase installed wind and solar power capacity to 200 GW and around 100 GW by 2020, respectively.

Notably, in late June Fujian Energy Group Co Ltd, the controlling shareholder of Fujian Funeng Co. Ltd, teamed up with China Three Gorges Corp (CTG) to jointly develop 1 GW of offshore wind projects in the country.

Under the INDC China also pledged to increase the use of natural gas, which is expected to make up more than 10 per cent of its primary energy consumption by 2020, and lower coal consumption by improving efficiency of newly built coal fired power plants.

World Resources Institute praised the country's effort to move to cleaner energy sources.

Jennifer Morgan, Global Climate Director, Climate Program commented: "China is largely motivated by its strong national interests to tackle persistent air pollution problems, limit climate impacts and expand its renewable energy job force." She said the target "demonstrates its intent to decarbonise its economy".

GE will support Vietnam power plant development

The recent signing of a memorandum of understanding (MOU) to support power plant development, and the start of construction of a major thermal plant will help Vietnam meet surging demand.

The MOU between state-owned, Electricity Vietnam (EVN) and GE calls for cooperation in developing EVN's capabilities and resources to meet growing demand. Additionally, the MOU calls for the sharing of technology updates that will help the country expedite the development of its energy infrastructure.

Under the MOU, GE will continue to assist EVN in the development of human resources. In terms of energy infrastructure development, GE will provide EVN with technology updates and support for power generation products, including high efficiency gas turbines, large-scale steam turbines, and wind turbines.

Both parties will also work together to expand and enhance the use of renewable energy in the country.

Vietnam's power sector received a boost with announcements of the start, or imminent start, of construction of several thermal plants.

Last month saw the start of construction on Vinh Tan 1 Thermal Power Plant.

Vinh Tan 1, to be built over four years under the build-operate-transfer (BOT) model, is one of four thermal power plants to be built in the central province of Binh Thuan. Together they will form the largest national thermal power complex in Vietnam, with a total capacity of 5600 MW.

The plant will cost about $1.7 billion, 95 per cent of which will be funded by two Chinese corporations, China Southern Power Grid Co., Ltd. and China Power International Holding Ltd.

Local media reported that construction on another $1.8 billion thermal power plant in central Nghe An province is expected to commence before October 10, 2015.

UK contracts spare capacity as winter margins fall

The rationale of capacity mechanisms is being questioned as National Grid procures spare supplies in the face of a dwindling reserve margin. **Siân Crampsie**

The UK's National Grid has bought in new reserve supplies for the winter ahead to ensure supply will meet demand.

The network operator reported last month that the margin of spare capacity would be just 1.2 per cent for the coming winter without the spare supplies procured.

National Grid revealed in a document that it had bought almost 2.6 GW of back-up capacity from four power stations in case cold snaps hit or the availability of other power stations fell. It has also struck agreements with major energy users to reduce their consumption when needed.

"The decision to procure this reserve… provides early certainty to the electricity market and means that a further tender round is unlikely unless a specific need arises," National Grid said in its report, which examines supply and demand last winter and gives an outlook for the next.

With the additional reserves bought, National Grid says that the reserve margin in the UK will reach 5.1 per cent in winter 15/16, slightly higher than last winter's 4 per cent.

Last winter the firm purchased around 1.1 GW of additional reserves from the market but interconnector availability and mild weather meant this spare capacity was not required.

Although the costs of the additional reserves equates to around £0.5/year on the electricity bill of an average consumer, the rationale of capacity mechanisms has been questioned.

The European Wind Energy Association (EWEA) said that capacity mechanisms were enabling European governments to keep unprofitable and dirty power plants online and were distorting power prices in the EU.

"The transformation of the European power sector must be driven by private investment and well-functioning markets," said Kristian Ruby, Chief Policy Officer at EWEA. "We must not keep redundant power plants on life support, particularly at a time when some countries are dealing with too much capacity. Financing conventional power plants to stay online must be a last resort option and only if Member States have gaps in capacity."

The UK is preparing to implement a full capacity market from 2018. In June the government published the parameters for the second capacity auction in December 2015, including for the first time interconnectors.

Netherlands boosts offshore wind

The Dutch Senate has adopted a new law on offshore wind energy that will help to create a clear framework for more widespread adoption of the technology.

The new law will not only boost employment, but also help the offshore sector in the Netherlands to reduce costs, said the Dutch Wind Energy Association (NWEA).

"With the new offshore wind energy law, Dutch authorities have created framework conditions to build offshore wind farms at the lowest possible cost," said Hans Timmers, chairman of NWEA.

"This is of great importance for the growth of renewable energy and represents a major boost for employment. Achieving the goals of the Energy Agreement is yet another big step closer," he added.

Offshore wind energy is one of the main pillars of the Dutch Energy Agreement (Energieakkoord). Existing offshore wind energy capacity and new capacity under construction in the Dutch North Sea amounts to 1000 MW of capacity, and the new law will help to add 3500 MW in the coming years.

The new law came after a Dutch court ruled that the Netherlands must take more action to reduce greenhouse gas emissions.

A Hague District Court judge in late June ordered the government to cut greenhouse gas emissions by at least 25 per cent by 2020 from 1990 levels.

The case was brought to court by Urgenda Foundation, a citizens' platform that promotes sustainability, on behalf of 900 plaintiffs.

Larne CAES wins European funding

- Blueprint for integrating large-scale renewables
- MOU for major offshore wind project in Irish Sea

Siân Crampsie

A compressed air energy storage (CAES) project in Northern Ireland could become a blueprint for the integration of large-scale renewable energy resources with the grid across Europe, its developers say.

Gaelectric's CAES project near Larne has been identified by the European Commission as a project of common interest (PCI) and last month won €6.47 million of funding from the European Union's Connecting Europe Facility (CEF) to help meet development costs.

The CEF Coordinating Committee said that the Larne CAES "would contribute to market integration, renewable energy input and system security in both Ireland and the UK (Northern Ireland)… The project is technologically innovative and has the potential to be replicated in other parts of the EU with suitable geological conditions".

Gaelectric, which also announced plans to develop an offshore wind demonstration site in the Irish Sea, plans to use salt caverns near the Antrim coast of Northern Ireland to store energy in the form of compressed air. The project would be able to release up to 330 MW for up to six hours.

Larne is the only storage PCI in the UK and the only CAES PCI in Europe. CEF funding will be used to help Gaelectric meet the costs of planning, front-end engineering design and the environmental impact assessment.

Brendan McGrath, CEO of Gaelectric, said: "The opinion and recommendation from the CEF Co-ordinating Committee is a further endorsement of the Larne CAES Project. [There is] growing recognition among policymakers and energy stakeholders of the vital role that large-scale energy storage must play in integrating increasing amounts of renewable energy within modern power systems.

"Larne and Northern Ireland will become the blueprint for CAES storage and the integration of renewable energy sources across the rest of the United Kingdom and Europe."

In July Gaelectric and Oriel Windfarm Ltd signed a memorandum of Understanding (MOU) to co-develop the North Irish Sea Array (NISA), an offshore wind farm with a potential capacity of 870 MW.

The partners will initially develop a 15 MW demonstration project entailing an investment of €80million in a new research and development hub for offshore wind energy.

NISA will be the first major offshore renewable energy project to be developed in the Irish Sea since the construction of the Arklow Bank Wind Farm by GE Electricity in 2001.

Gaelectric and Oriel say that the demonstration will be a key first step towards a larger NISA development and could also be a catalyst for other wind developments in Ireland, which is thought to have an offshore wind potential of up to 10 GW. "This project represents the biggest step forward for the Irish offshore wind energy sector in the last ten years," said Brian Britton, Managing Director of Oriel Windfarm.

France reviews climate change commitment

France is reviewing a proposed new climate change commitment amid concerns over job losses.

The French government last year said that it would push internationally for the removal of subsidies in the fossil fuel sector and remove export credits for coal technology to developing countries.

However it is now considering a number of exemptions, according to the *Financial Times*, because a withdrawal of export credits would put jobs at risk at power technology firm Alstom.

According to the *FT*, The French exemptions – some of which could delay the ban until after 2020 – were laid out in a June 25 memo to the French National Council for Ecological Transition, which includes non-governmental organisations, politicians, and local communities.

The review of the proposed policies follows a decision in Germany to scrap plans for a climate change levy on the power sector and indicates the ongoing conflict between environmental goals and economic reality for governments.

In June the parties in the German coalition government reached a deal on meeting 2020 climate change goals.

It has decided to close around five of the country's largest brown coal fired power plants instead of implementing a climate change levy, a move that has been welcomed by the power sector.

The Economy Ministry said that the decision would mean that Germany could meet its target of reducing CO_2 emissions by 40 per cent by 2020 compared with 1990 emissions.

"Brown coal-fired plants with a capacity of 2.7 GW will be mothballed. Those plants will not be allowed to sell any electricity on the normal power market," said a spokesman after the deal was clinched on July 2nd.

The deal also includes an agreement to set up a capacity reserve system, allowing utilities to re-start brown coal fired power plants in the event of power shortages.

Environmentalists have criticised both France and Germany, noting that their decisions threaten the momentum of the climate change movement ahead of the UNFCCC conference in Paris in December.

Germany's plans also include a range of energy efficiency initiatives. All in, its plan will reduce emissions by 11-12.5 million t CO_2e by 2020. German research institute DIW says that the measures to be adopted will not have a significant impact on wholesale power prices in the country, while the gradual closure of lignite power plants could be offset by a growth in renewables.

Renewables help to uncouple economic growth and carbon emissions

Renewables enjoyed record growth in 2014 but headwinds in 2015 are putting investment at risk.

Siân Crampsie

The world's economy is becoming less carbon intensive thanks to the growth of renewable energy and an emphasis on energy efficiency in some OECD countries.

Analysis by REN21, a global network of renewable energy advocates, shows that for the first time in four decades, the world economy grew without a parallel rise in CO_2 emissions in 2014.

The landmark "decoupling" of economic and CO_2 growth is due in large measure to China's increased use of renewable resources, and efforts by countries in the OECD to promote more sustainable growth, including increased use of energy efficiency and renewable energy.

"Renewable energy and improved energy efficiency are key to limiting global warming to two degrees Celsius and avoiding dangerous climate change," said REN21 Chair Arthouros Zervos.

REN21's data shows that global energy consumption has grown 1.5 per cent on average per year in recent years, while GDP has grown an average three per cent per annum. At the same time, CO_2 emissions in 2014 were unchanged from 2013 levels.

"For the first time in decades, energy-related greenhouse gas emissions levelled out while GDP continued to grow in 2014," said Alexander Ochs, Director of Climate and Energy Program at the Worldwatch Institute. "This encouraging trend is due to the remarkable success of renewables."

According to REN21, investments in the renewable energy sector in 2014 drove record levels of capacity additions. Supported by incentive programmes in 164 countries around the world, about 135 GW of wind, solar and other renewables technologies was added to the grid.

Global installed renewable energy capacity now stands at 1712 GW, up 8.5 per cent from the year before, said REN21.

REN21 also said that the renewable energy sector's growth would be even greater if the more than $500 billion in annual subsidies for fossil fuel and nuclear energy were removed.

"Creating a level playing field would strengthen the development and use of energy efficiency and renewable energy technologies," said Christine Lins, Executive Secretary, REN21. "Removing fossil fuel and nuclear subsidies globally would make it evident that renewables are the cheapest energy option."

But the pace of renewable energy investment may not be sustained. Bloomberg New Energy Finance said last month that clean energy investment worldwide was $53 billion in the second quarter of 2015, just three per cent less than the $54.4 billion invested in the first quarter, but down 28 per cent compared to the second quarter of 2014.

BNEF said that global clean energy investment this year is facing headwinds from the financial markets, with the sharp rise in the US currency over the last 12 months reducing the dollar value of deals struck in other countries. In addition, it said that volatility in share prices, particularly in China, was holding back equity-raising by specialist clean energy companies from both public market investors and venture capital and private equity funds.

However, there continues to be bright spots, notably small-scale solar, which enjoyed investment at $20.4 billion in the second quarter, 29 per cent up on Q2 2014.

Small solar projects of less than 1 MW remain on course for a record year, as countries such as the US, Japan and China, and other parts of the developing world, respond to the improved cost-effectiveness of rooftop photovoltaics after the price falls of recent years.

Other features of Q2 were European offshore wind, where two project financings accounted for nearly $4.2 billion of investment between them (the 402 MW Veja Mate array in German waters, and the 400 MW E.On Rampion project off the coast of England), and Chile's $1.3 billion of investment in wind and solar, the highest that country has committed in any quarter to date.

Progress for Paris but deal could be weak

Several key economies from around have made new pledges on greenhouse gas emissions ahead of December's Paris climate talks.

The USA and Brazil in June jointly announced plans to each get 20 per cent of their electricity from non-hydropower renewable sources, such as wind and solar power, by 2030.

Separately, China and South Korea formally submitted their climate change plans to the UN for the Paris meeting.

Their pledges follow similar plans submitted by the EU and other major economies, and mean that countries accounting for more than 70 per cent of global greenhouse gas emissions have set out their climate change plans.

The USA's pledge means that it will triple the amount of renewable power on its electricity grid, while Brazil would more than double its share. Brazil also said it would restore 12 million hectares of forest by 2030, an area nearly the size of England.

However, India, Japan and Australia have yet to submit their plans, and there remain tricky issues to be negotiated at the Paris talks.

These include discussions on how countries will be held to the pledges they have made, and how much money rich countries should channel to developing nations to help them tackle climate change, beyond the $100 billion a year that wealthy economies have already said they will muster by 2020.

There is also disagreement over whether an international accord should contain measures covering the loss and damage that poor countries may suffer because of climate change.

Formal discussions taking place in the run-up to the Paris talks are making more progress than previously thought, however, according to a French government document seen by the *Financial Times*.

The British newspaper reported last month that a groundbreaking climate deal was edging closer, with convergence among negotiators on the broad outlines of a global deal. There is concern, however, that a final agreement may be too weak to prevent global warming.

The UN says that even when key economies such as Japan and Australia submit their climate plans, national pledges made for Paris are likely to fall short of what is needed to stop global temperatures rising more than 2 degrees from pre-industrial times. Scientists say this limit should not be breached if risky and irreversible climate change is to be avoided.

Egypt seeks private investors with new law

Egypt is considering a new law that would liberalise the electricity market and encourage private sector investment.

The electricity law was issued by President Abdel Fattah al-Sisi in July and proposes that the state give up the management of public utilities. The Ministry of Electricity said that the bylaws of the new legislation would be issued in the next six months.

The new law would resolve the issue of subsidies in the electricity sector, a factor that has deterred private investors, and would leave the state responsible only for organising the industry.

The law also separates the Egyptian Electric Utility and Consumer Protection Regulatory Agency from the Electricity Ministry, making it an independent body tasked with regulating the market.

Egypt wants to attract private investors to its electricity sector to refurbish infrastructure damaged after the ousting of president Mohamed Mursi in 2013.

■ The Arab Renewable Energy Company Organization (ARECO) has signed a joint cooperation agreement with Z-One Holding FZCO of the UAE. The two companies are aiming to jointly develop solar photovoltaic (PV) projects in Egypt and other parts of Africa. They have already announced the launch of a 52 MW module manufacturing facility in Cairo.

Scatec Solar signs Mali PPA

Mali is to build west Africa's first utility-scale solar power plant after signing an historic agreement with Scatec Solar.

Norway-based Scatec has signed deals with the Malian Ministry of Energy and Water and Electricité de Mali (EDM) to develop a 33 MW project in partnership with IFC InfraVentures and local developer Africa Power 1.

The €52 million plant will supply energy to EDM under a 25-year power purchase agreement. Scatec Solar will own 50 per cent of the power plant and World Bank's project development fund, IFC InfraVentures will hold 32.5 per cent. Africa Power 1 will hold a 17.5 per cent stake.

Scatec Solar will construct the plant, and in addition provide operation and maintenance services after the plant is connected to the grid.

Scatec Solar and EDM will jointly register the project with the United Nations CDM (Clean Development Mechanism), it said.


Mali will build west Africa's first utility-scale solar power plant

Alstom, GE attempt to ease EU Commission concerns

- Alstom lowers sale price
- GE could offload Alstom gas turbines to Ansaldo

Junior Isles

Alstom and GE are making concessions in an attempt to gain approval from the EU competition authority for GE's deal to buy a large part of Alstom's power business.

At the end of April this year, Alstom agreed to sell most of its energy unit to GE in the face of slowing demand for power plants in Europe and rising competition.

Under the contract details, GE and Alstom would form three joint ventures: Grid – the combined grid assets of GE and Alstom; Renewables – Alstom's offshore wind and hydro businesses; and Global Nuclear and French Steam – Alstom's production and servicing of equipment for nuclear power plants, and development and sales of new nuclear equipment around the world, and Alstom's steam turbine equipment and servicing for applications in France.

The deal, however, has raised competition concerns about the possible decrease in gas turbine competition that may result.

The European Commission argues that the deal would leave only Siemens AG as GE's main rival in Europe in the market for gas turbines used in gas fired power plants. Both General Electric and Alstom believe the deal is procompetitive but have agreed to explore remedies to secure clearance.

In late July, Alstom offered a 2.4 per cent discount to the previously agreed €12.35 billion deal as a contribution to GE's efforts to win antitrust clearance in Europe.

"In order to support General Electric in its offering of a comprehensive set of remedies addressing the concern of the (European) Commission, Alstom's board... would contribute financially to such remedy package through a reduction of €300 million," the French engineering company said in a statement.

On July 16, GE said it had offered unspecified concessions in an attempt to counter EU regulatory concerns about the deal, which was agreed on April 30th and would be its biggest ever acquisition.

According to Bloomberg Business sources, in the latest concession GE has offered to sell gas turbine assets to Italian rival Ansaldo Energia.

The move would give Ansaldo access to Alstom's installed base – turbines that have already been sold and for which the French manufacturer holds a long-term servicing agreement – but the concessions do not include the entire European fleet, Bloomberg reported. GE has reportedly also offered to sell some intellectual property to the Italian firm.

Gaining access to Alstom's installed base of large and very large turbines will be key for Ansaldo to become a viable competitive force – allowing it to benefit from Alstom's client base and its profitable servicing business, said Bloomberg's sources. As part of GE's offer to the EU, Ansaldo could also buy Alstom's Power Systems Manufacturing unit, which can service gas turbines of different makes.

GE and Alstom have been working with regulators around the world to secure competition and regulatory authorisations. Approvals have already been granted in 15 countries.

The European Commission has set a September 11 deadline to rule on the deal.

France deepens Chinese nuclear ties

France and China have agreed to deepen cooperation in the nuclear energy field through a series of agreements between CGN, CNNC, EDF and Areva.

The agreements came after a joint declaration was made on June 30, 2015 in Paris between Mr. Li Keqiang, Premier of the People's Republic of China, and Manuel Valls, Prime Minister of the French Republic, covering civil nuclear power, and will help to cement the French firms' foothold in the Chinese market.

CGN signed a letter of intent with Areva and EDF on long-term cooperation in nuclear reactors, under which the companies will explore the feasibility of developing medium and high-powered reactors globally.

CNNC signed an agreement with EDF on global cooperation, and a memorandum of understanding with Areva on a Chinese project for a used fuel processing and recycling facility.

The MoU with Areva formalises the end of technical discussions, defines the schedule for commercial negotiations and confirms the willingness of both groups to finalise the negotiations in the shortest possible timeframe.

CNNC and Areva also signed an agreement on the fuel cycle, covering extraction and conversion of uranium, fabrication of zirconium fuel assemblies, and deconstruction, dismantling and transportation.

Earlier this year the French company announced plans to refocus on nuclear fuel cycle activities as part of a wider reorganisation plan.

In June it said it would sell its subsidiary Canberra, which specialises in nuclear measurement systems and instrumentation.

Bsed in Connecticut, USA, Canberra achieved a sales revenue of approximately €180 million in 2014 and employs over 1000 personnel globally.

Engie bolsters solar presence

Engie has become a leader in the French solar market with the acquisition of a 95 per cent stake in Solairedirect, a France-based developer and operator of solar farms.

Engie called the move "a crucial step forward" in the implementation of its solar strategy that would strengthen its position in the French and global solar markets.

Solairedirect is present in more than 15 countries and operates a total gross installed capacity of 224 MW in France. Its target is to develop 125 MW of PV capacity per year.

"By pooling the expertise of Solairedirect and Engie staff, we will be able to speed up our development in renewable energies, in line with our strategy to spearhead Europe's energy transition and become the benchmark energy supplier on high-growth markets," said Gérard Mestrallet, Engie Chairman and CEO.

Solairedirect is active in South Africa, India, Chile, the United States, Mexico and Thailand. The company has a portfolio of projects at the preconstruction phase amounting to more than 4.5 GW in the targeted regions, 434 MW of which is set to be built within the next 6 to 18 months.

Engie has installed solar capacity of 201 MW across the world, including 22 ground-based PV facilities in France with a total capacity of 158.5 MW. One key project is construction of the 100 MW concentrated solar power (CSP) plant at Kathu in South Africa, and there are other projects at various development stages in Chile totalling more than 600 MW.

Bright spot: Solairedirect is present in more than 15 countries

SunEdison seals wind JV

- 1 GW deal with Gamesa
- 50 MW India PV site inaugurated

Siân Crampsie

SunEdison is to expand its global presence through a new joint venture alliance with Gamesa, the Spanish wind energy company.

The two firms have signed a memorandum of understanding for the development of up to 1 GW of wind energy projects by 2018.

Located predominantly in India and Mexico, the projects will help SunEdison to grow its position in the global wind energy market. It will also enable Gamesa to unlock the value of its project pipeline.

Under the terms of the deal, a 50-50 joint venture firm will develop projects selected by SunEdison from Gamesa's global pipeline. Once ready to build, the projects will be acquired by SunEdison for construction using Gamesa wind turbines.

The Spanish company will also supply engineering, procurement and construction (EPC) services and operate and maintain the projects under long-term agreements.

Once operational, the projects will be acquired by SunEdison yieldco, Terraform power.

"This agreement will accelerate SunEdison's drive to respond to rapid growth in global wind markets," said Paul Gaynor, SunEdison Executive Vice President of the Americas and EMEA. "By partnering with Gamesa, one of the world's leading wind technology and development companies, we're particularly well positioned to capture the opportunity in India and Mexico, two regions where we already have a strong solar presence."

SunEdison reiterated its guidance of producing 2100-2300 MW solar and wind energy projects in 2015. Last month it announced the inauguration of a 50 MW solar photovoltaic (PV) plant in India, and said it would acquire Vivint Solar, a specialist rooftop solar developer.

In the Indian state of Madhya Pradesh, SunEdison inaugurated the Dammakhedi solar farm, the first in the state to use single axis tracker technology and one of the first projects to be commissioned under the second phase of the Jawaharlal Nehru National Solar Mission (JNNSM).

"As India's economy continues to grow, it will need access to clean, cost-effective and reliable electricity," said Pashupathy Gopalan, SunEdison's Asia-Pacific President.

"Solar generated electricity is the ideal solution. The Dammakhedi plant... is a case study in SunEdison's ability to deliver projects quickly and efficiently," he added.

Americas

Microturbine ordered for flare gas

Capstone Turbine Corporation has received an order from Kineticor Resource Corporation for a C1000 microturbine for installation at a power generation facility fuelled by flare gas.

Kineticor, a specialist in the provision of customised and reliable on-site power generation solutions for the resources sector, will build the power plant, which will use flare gas produced by an energy company in central Saskatchewan, Canada.

In Saskatchewan, strict guidelines have been imposed to reduce flaring of associated gas from oilfields, driving demand for microturbines and other fuel flexible technologies.

GE upgrades Tiverton

Emera Energy has selected GE to upgrade its Tiverton power station in Rhode Island, USA.

The project will increase the efficiency, capacity and long-term availability of the 265 MW power plant and reduce its operating costs and environmental impacts.

GE will install its power FlexEfficiency solutions at the facility, adding 22 MW of additional capacity to the plant. Equipment to be supplied includes a 7F.04 compressor, dry low NOx 2.6+ combustor and advanced gas path technology.

Areva Forward Alliance success

Areva has been awarded a three-year, multi-million dollar contract to perform outage and maintenance activities for five nuclear power facilities throughout the USA.

Beginning in 2016, Areva will provide integrated outage services for two boiling water and six pressurised water reactors. This contract includes inspection and maintenance services for the reactor vessel and vessel internals as well as the steam generators and reactor coolant pump motor refurbishments.

The contract was secured under Areva's "Forward Alliance" programme, which enables customers to combine a variety of advanced products and services into an integrated plan to meet their unique requirements.

Yingli supplies 240 MW for hybrid solar plants

Yingli has signed a deal to supply 240 MW of solar panels for Latin America's two largest hybrid solar photovoltaic (PV) and concentrated solar power (CSP) plants.

Yingli will supply 780 000 multi-crystalline utility-scale YGE 72 Cell solar panels to the projects, which will be installed in two phases. The projects will also be equipped with 110 MW of CSP and 17.5 hours of thermal storage.

The first phase of panel deliveries was recently completed, and the second phase will start in August. The first power plant is expected to be operational by mid-2016.

Asia-Pacific

LG CNS secures solar project

Korean IT solution provider LG CNS has secured a Won130 billion ($112 million) project to build a 33 MW solar power plant on the island of Kyushu, Japan.

The plant will be located in the city of Imaichi, Oita Prefecture. It is the third solar power project secured by LG CNS in Japan and will use solar modules supplied by LG Electronics, its sister company.

LG CNS signed the deal with Oita Solar, a special purpose company in which US solar developer Sonnedix has a stake. LG CNS is a preferred bidder for Sonnedix's new solar power projects in Japan, which have a combined power capacity of 80 MW.

Gamesa wins in India

Gamesa has strengthened its position in India with an order from Orange for the supply of 250 MW.

The company will install 125 of its G97-2.0 MW Class S turbines at three wind farms located in the states of Andhra Pradesh and Madhya Pradesh being developed by Orange, one of India's leading independent power producers (IPPs).

ABB upgrades substations

ABB has won an order worth around $28 million from India's leading transmission company, PowerGrid Corporation of India Ltd (PGCIL), to extend three substations in Vadodara, Manesar and Malerkotla, across the country's eastern and northern regions.

The projects will help India to meet growing electricity demand in the states of Gujurat, Haryana and Punjab, which form a significant part of the country's agricultural belt.

In Vadadora and Manesar ABB will extend the current 765/400 kV gas insulated switchgear (GIS) substations, while in Malerkotla the substation will be upgraded from air-insulated switchgear (AIS) to GIS.

Vestas sees growth in S Korea

Vestas has received a firm order for 13 wind turbines for a project in South Korea's northeastern Gangwon province.

Vestas will provide its V100-2.0 MW turbines for the project, which is being developed by one of the largest conglomerates in South Korea which has been active in the wind power industry as a project developer and EPC contractor.

The turbines will be the first V100 units in the country, which is seen as an increasingly attractive wind energy market, said Vestas.

Delivery and commissioning are expected in the second half of 2016. Vestas' deal includes a 10-year active output management (AOM) service contract.

Vestas has an installed capacity of 226 MW in South Korea, accounting for about half of the total wind energy capacity in the country.

Baleh tenders released

Sarawak Energy Bhd (SEB) has tendered out three of the eight major work packages for the RM9 billion ($2.36 billion), 1285 MW Baleh hydropower dam project in Malaysia.

Group chief executive officer Datuk Torstein Dale Sjotveit said the tenders for the project's diversion tunnels packages had closed and the bidders were currently being evaluated.

The tender for the third package – operator's village – closed in July. The remaining five packages are jetty, bridges and road, main civil works, main electrical mechanical works, transmission line and substation.

The Baleh dam is the second major hydro project to be undertaken by SEB and will take seven years to build.

The state-owned company has invested some RM4 billion in the 944 MW Murum dam, which is now in full commercial operation following the completion of the reliability run of all its four turbines.

Vinh Tan 1 FGD awarded

Doosan Lentjes is to provide its flue gas desulphurisation (FGD) technology for the 2x620 MWe Vinh Tan 1 coal-fired power plant currently under construction in Vietnam.

Doosan Lentjes' seawater FGD technology will reliably remove sulphur dioxides (SO_2) from the power plant's flue gas in order to meet the most stringent emission standards. Its scope of supply includes engineering and delivery of key FGD equipment such spray nozzles, spray banks, mist eliminators and other internals for the absorbers, seawater pumps, aeration elements for the aeration basin, and aeration blowers as well as the DCS system for FGD.

Europe

Denmark launches offshore test scheme

The Danish Energy Agency (DEA) has issued a call for applications for a new offshore wind technology test scheme of 50 MW. The deadline for applications is 15 October 2015 and the first commitments will be assigned by the end of the year.

The test scheme aims to develop new and innovative wind turbine projects that have the potential to reduce the production costs of electricity from offshore wind turbines.

The applications will be rated on the development potential of the projects as well as their potential to lead to real cost reductions in the market. Projects that are assessed to have the overall largest effect on the possibilities to reduce the cost of offshore wind farms will be granted the aid.

The test scheme is part of the 2012 Energy Agreement, which sets aside 50 MW out of a total of 400 MW near-shore wind turbines for offshore test projects.

NSN Link awards €1.5 billion of contracts

Contracts totalling €1.5 billion have been awarded to build the NSN Link – the first electricity link between UK and Norway.

NSN Link has contracted with two cable suppliers, Prysmian and Nexans, to deliver the cable needed for the 740 km route. The converter stations in both UK and Norway will be delivered by ABB.

The project is a joint venture between National Grid of the UK and Norway's Statnett. The new interconnector will contribute to increased production and use of renewable energy on both sides and will have a capacity of 1400 MW.

The link is expected to be in operation by 2021.

Turnkey order for Nordex in France

Saméole has placed a turnkey order with Nordex for the installation of four wind turbines at the Ondefontaine wind farm in France.

Nordex will provide four Gamma N100/2500 turbine units for the project, located near the northwest coast of France in the Basse-Normandie region.

Nordex started construction work on the project in June and it is due to be connected to the grid at the beginning of May 2016. Following commissioning, Nordex will support the wind farm for a period of ten years on the basis of a premium service agreement.

Amprion orders grid control system

Siemens has received an order from Amprion to supply a new grid control system for the transmission grid operator's Brauweiler main control centre in Germany.

Siemens will supply its Spectrum Power 7 system, which will not only assist the control engineers in monitoring and managing the transmission grid but also improve operational management of renewable energy sources.

The two companies hope that the project will set new standards in grid control. "In our partnership with Amprion, we will help make the new Brauweiler main control centre a benchmark in the ENTSO-E environment.

Equipped with our new Spectrum Power 7 system, Amprion will be well prepared to meet future grid management challenges," said Jan Mrosik, CEO of the Siemens Energy Management Division.

International

CNEEC awards hydro contract

China National Electric Engineering Co. Ltd. (CNEEC) has awarded Alstom a €50 million contract to provide electro-mechanical equipment and technical services for the Zungeru hydropower project in Nigeria.

Alstom will provide four 175 MW Francis turbine-generator sets and related equipment for the project, the largest hydropower plant under construction in Nigeria.

The 700 MW plant is located on the middle and upper reaches of River Kaduna near Zungeru and is part of Nigeria's Renewable Energy Master Plan.

Israel inks $1 billion solar plant deal

Israel has signed a deal to build a multi-megawatt, concentrating solar power (CSP) plant in the country's southern Negev desert.

A consortium of Israel's Shikun & Binui and Spain's Abengoa are to build the $1 billion plant at Ashalim, which will be financed by the European Investment Bank and the US Overseas Private Investment Corp.

The 110 MW project is due to be completed by 2018. It forms part of Israel's plan to source ten per cent of its electricity needs from renewable sources by 2020.

German firms consult on Uzbek solar project

Uzbekenergo has signed a contract with three German companies for the provision of consulting services for the construction of a solar power plant.

GOPA-International Energy Consultant GmbH, Suntrace GmbH and Renewables Academy AG (RENAC) will assist Uzbekenergo, a state joint stock company, with the development of a 100 MW solar plant in Samarkand province.

The project would be the first solar power plant in the country and would cost $310 million to build. Financial assistance for the project is being provided by the Asian Development Bank, Uzbekenergo and Uzbekistan's Reconstruction and Development Fund.

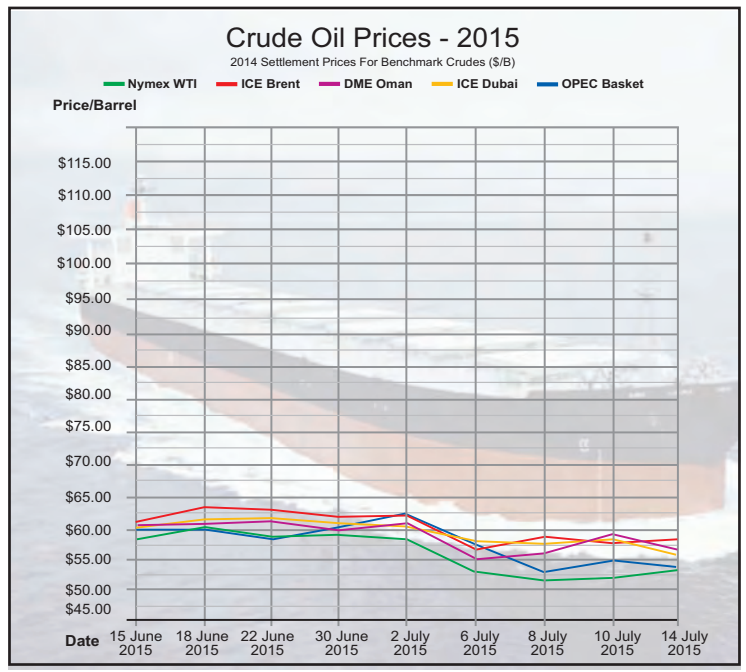
Uzbekistan adopted a programme on developing alternative energy resources in 2013. The country plans to construct several solar power plants with a total capacity of over 2 GW and a facility to produce photovoltaic panels.

Oil

Iran keen, but not ready for return to oil market

- Significant crude production not expected until 2016
- Rise in production will depress prices

David Gregory



Despite statements from Iranian Oil Minister Bijan Namdar Zanganeh that Iran will be able to return to the oil market soon after international sanctions are lifted, it will likely be mid- to late 2016 before Iranian crude makes any significant return.

In July Iran and the P5+1 Group agreed the terms concerning Iran dismantling its nuclear research programme. Since the initial terms of the accord were agreed in April, there has been a heady response from Iran, demanding that all sanctions be lifted once the deal was signed.

This position played well in Iran itself, which has felt the sting of sanctions on oil exports since 2012 and those of other sanctions that have been in place for decades. But until Iran meets the key components of the accord, it cannot expect Western governments to ease sanctions, which are demonstrated to have worked well enough to get Iran to the negotiating table.

The agreement stipulates that sanctions will be removed incrementally as Iran meets the criteria for downgrading its nuclear programme.

US Secretary of State John Kerry made it clear shortly after the deal was agreed that sanctions relief would come only after Iran complied with the crucial criteria of dismantling its nuclear programme. That part of the deal is "fundamental," Kerry said.

Iran's delay in returning to the oil market is likely good news for other oil producers who are now battling for market share. Opec leader Saudi Arabia's oil production hit an average of 10.56 million b/d in June and Opec's total average production for the month hit 31.38 million b/d, well above its 30 million b/d target.

Agencies that track crude markets report that oil supply is exceeding demand by as much as 3 million b/d. Global oil supply is reported to be near 94 million b/d. The surplus is expected to subside by the end of the year to around 1 million b/d and after an increase during the first half of 2016, begin to recede later next year.

It will take Iran that long to make any significant return to the market. The country will need significant investment and technical assistance if it is to fully realise not only its oil potential, but its gas potential too. Iranian oil and gas reserves are nearly the highest in the world.

Iran now exports about 1 million b/d to countries that were exempted from repercussions for breaking the sanctions regime and it could boost that by another 1 million b/d in the years ahead.

The oil market has apparently realised that a boost in Iranian oil exports will not be immediate. Iran does have some 40 million barrels in floating storage, but it is not at liberty to sell that oil while sanctions are in place.

Moody's rating agency said in a report in late July that should Iranian crude production rise by 1 million b/d within one or two years, it would "inevitably depress prices."

This, it added, would undermine the creditworthiness of other crude exporters with weak financial buffers, particularly Russia, Venezuela, Nigeria, Bahrain and Oman.

Saudi Arabia, which has sufficient assets to draw up for several years, would not be so adversely affected, the report said.

Prior to sanctions, Iran had the capacity to produce 3.5 million b/d, but it was forced to shut in major oilfields in order to comply with sanctions and in cutting production from those fields they have probably lost the ability to produce at their previous rate. It could take considerable effort to restore them to previous production levels.

However, some estimates suggest that Iran could be producing 4 million b/d by 2017. Investment in Iran's oil sector would require as much as $230 billion to get production near that rate, it is estimated.

This is where Western expertise will come in. Shell, Eni and Total have been conferring with Iran, expressing their interests in investing in its hydrocarbon sector. But as Iran's earlier agreements with foreign companies provided unfavourable terms, foreign companies are now expecting better arrangements – and if Iran is serious about boosting oil production quickly and accessing its huge natural gas reserves, it will make investment in Iran more attractive for foreign firms.

Gas

Europe moves to connect missing gas links

Motivated primarily by a desire to reduce dependence on Russian gas, the EU is taking steps to assure the bloc and its neighbouring states of steady gas supplies.

Mark Goetz

The European Union has long realised that its energy security could be greatly enhanced if it took measures to connect the missing pieces of pipelines that would link EU members' gas grids and move it towards being an integrated system that better serves all its members.

Last month several measures were taken by EU members to connect their systems and cooperate for the purpose of assuring themselves and neighbouring states of steady gas supplies. Once implemented, a ring of gas pipelines through East Europe would contribute to regional EU members finding there is safety in numerous interconnections.

Motivated primarily by a desire to reduce dependence on Russia for natural gas supplies, the EU on July 14 announced that member states had agreed to allocate €150 million to trans-European infrastructure projects. Most of the financial support will be channeled to projects in Central Eastern and Southeastern Europe and to the Baltic states. In total some 20 projects will qualify under the Connecting Europe Facility (CEF), which is designed to fund infrastructure.

"The selected projects will increase energy security and help end the isolation of member states from EU-wide energy networks," the European Commission said in a statement released in Brussels. "They will also contribute to the completion of a European energy market and the integration of renewable energy sources into the electricity grid."

Eleven of the 20 projects to receive funding are in the gas sector. They will receive €80 million, while nine electricity projects will receive €70 million. The money will cover 17 studies allocated a total of €30 million. Three construction projects will receive €120 million.

Under the CEF, the European Commission has allocated €5.35 billion for trans-European energy infrastructure funding between 2014-20.

In Dubrovnik on July 10, some 15 EU energy ministers and the commissioners of energy union and climate action and energy signed a memorandum of understanding designed to launch an initiative to connect the energy grids among EU members in Eastern Europe.

The MOU calls for EU members in Central East and Southeastern Europe to accelerate the construction of the missing links that will connect their gas networks and to address the remaining technical and regulatory issues that hamper security of supply and the development of a fully integrated and competitive energy market for the region.

A statement said the initiative would focus not only on building new gas pipelines, but also on making the best use of existing infrastructure for example by allowing reverse gas flow.

A number of infrastructure projects, such as the Trans Adriatic Pipeline (TAP), LNG terminal in Croatia and evacuation system, system reinforcement in Bulgaria and Romania, interconnectors between Greece and Bulgaria and between Serbia and Bulgaria, have been identified as top priorities in the action plan annexed to the MOU, the statement said.

"This region is very important for Europe, in particular when we look at security of energy supply," Maros Sefcovic, EU Commission Vice-President for Energy Union said. "The improvement of infrastructure through realistic and feasible projects is crucial to diversify energy resources and strengthen the region's resilience to supply shocks. Cooperation among the countries of the region is key in this regard," he said.

The EU has apparently decided to move swiftly in light of the continuing trouble between Russia and Ukraine, through which some 40 billion m^3 (bcm) of Russia passes every year on its way to Europe, and Russia's plan to cancel the South Stream gas pipeline across the Black Sea – its plan to bypass Ukraine.

Russia now proposes to deliver some 47 bcm/year to Europe through the Turkish Stream, another project proposed in December that will cross the Black Sea but land in western Turkey instead of EU member Bulgaria. But Russia and Turkey have yet to agree on the details of the project and there are questions as to whether it will actually happen.

The EU does not support the Turkish Stream idea, which would have European customers take delivery of Russian gas at the Turkish-EU border, requiring EU states to build new infrastructure to accommodate the Russia plan.

The EU would prefer to stick with the current system of delivery through Ukraine, but Moscow-Kiev relations are such that this might not prove practical by 2019, when Turkish Stream is scheduled to come into operation.

During the gathering of ministers in Dubrovnik, Sefcovic acknowledged that EU domestic gas production is declining and could lead the EU to a greater dependency on imports.

"We must make sure that our supplies are diversified," he said. "We need to make sure that nobody will be in a dominant position that would negatively influence our energy security."

Cumulative power plant capacity additions by region and source in the New Policies Scenario (GW)

	2014-2025						2026-2040						2014-2040
	Coal	Gas	Oil	Nuclear	Renewables	Total	Coal	Gas	Oil	Nuclear	Renewables	Total	Total
OECD	**63**	**333**	**20**	**39**	**548**	**1 004**	**56**	**253**	**12**	**79**	**940**	**1 340**	**2 343**
Americas	9	162	15	9	207	402	16	147	2	28	367	560	962
United States	5	126	14	9	155	309	14	102	0	25	286	427	736
Europe	36	107	1	12	249	404	28	80	2	35	436	582	986
Asia Oceania	18	65	4	19	93	197	12	25	9	16	137	198	395
Japan	5	51	4	3	64	126	3	13	7	3	86	112	238
Non-OECD	**554**	**454**	**37**	**118**	**885**	**2 048**	**690**	**580**	**41**	**144**	**1 360**	**2 815**	**4 863**
E. Europe/Eurasia	47	105	1	20	36	210	36	84	3	36	73	232	442
Russia	17	64	0	17	18	116	12	56	1	22	36	127	244
Asia	471	174	4	89	666	1 404	597	264	8	87	921	1 877	3 281
China	257	81	0	75	467	881	202	78	2	57	496	835	1 716
India	135	43	1	10	112	302	250	71	0	24	258	603	905
Southeast Asia	58	36	2	1	42	138	112	71	5	4	83	274	412
Middle East	1	78	15	6	23	122	0	73	14	9	109	206	328
Africa	31	60	8	-	63	162	50	100	14	7	140	312	473
Latin America	4	37	8	3	97	150	6	59	3	4	118	189	339
Brazil	2	10	4	1	59	77	3	23	0	3	69	97	174
World	**617**	**788**	**57**	**157**	**1 433**	**3 052**	**746**	**833**	**53**	**222**	**2 301**	**4 155**	**7 207**
European Union	33	92	1	12	229	366	25	62	2	33	408	531	897

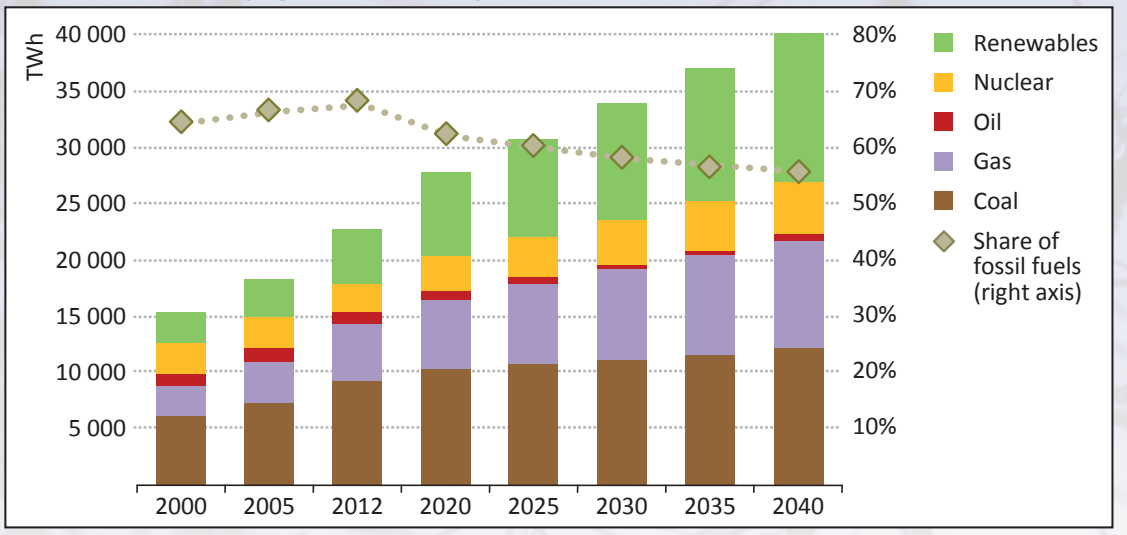
World Energy Outlook 2014, © IEA/OECD, Table 6.4, page 213

For more information, please contact:

International Energy Agency
9, rue de la Fédération
75739 Paris Cedex 15
France.

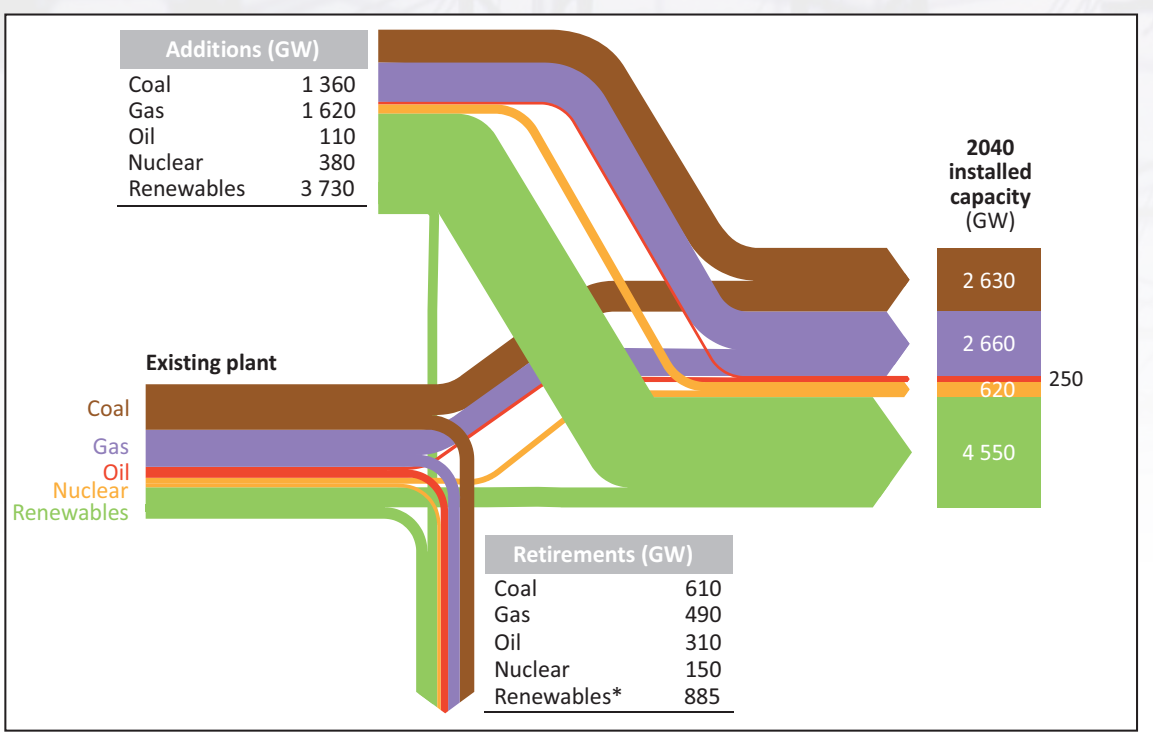
Email: bookshop@iea.org
website: www.iea.org

World electricity generation by source in the New Policies Scenario



World Energy Outlook 2014, © IEA/OECD, Figure 6.8, page 216

Power generation capacity flows by source in the New Policies Scenario, 2014-2040

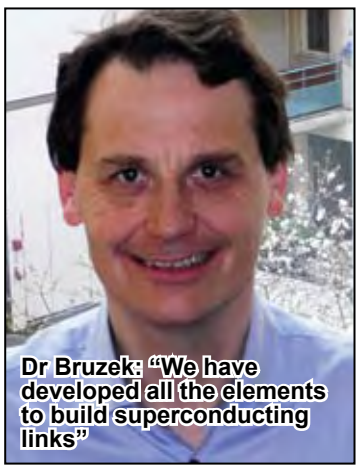


World Energy Outlook 2014, © IEA/OECD, Figure 6.5, page 210

Source: World Energy Outlook 2014

Can superconductors drive the energy transition?

At a recent roundtable in London, UK, Nexans' Dr Christian-Eric Bruzek, shared his views on the role of superconductors in the energy transition. **Junior Isles** reports



Dr Bruzek: "We have developed all the elements to build superconducting links"

Europe's much talked about energy transition is well under way. In its latest EU-wide progress report on renewable energy published in June, the European Commission says 25 EU countries are expected to meet their 2013/2014 interim renewable energy targets.

Today, 26 per cent of the EU's power is already generated from renewables, with about 10 per cent of the total EU electricity sourced from variable renewable electricity such as wind and solar.

Wind power generation more than tripled over the period 2005-2014 and it has become the second largest contributor to renewable electricity. Preliminary 2014 data indicate that power production from wind reached 247 TWh compared to 234 TWh in 2013. Solar electricity generation has also increased rapidly and in 2013 accounted for 10 per cent of all renewable electricity.

But while the growth in renewables is noteworthy, their effective use will never truly be achieved without the development of the necessary supporting grid infrastructure. In Germany for example, expanding the electrical grid has become a crucial pre-condition for the success of its so-called *Energiewende*.

Notably, October last year saw the launch of a EU-funded programme known as BEST PATHS (BEyond State-of-the-art Technologies for re-Powering AC corridors and multi-Terminal HVDC Systems) Project. The RD&D project, which is part of the European Union's 7th Framework Programme (FP7), is an initiative that explores new avenues for delivering affordable, reliable power in Europe from 'coast-to-coast', focusing in particular on the removal of barriers to the large-scale penetration of renewable electricity production.

The project has seen nearly 40 leading European organisations from science and industry join forces with utilities and transmission system operators for what is the largest EU-funded research project on energy transmission to date. The total budget is €62.8 million with a EU contribution of €35.5 million.

Running from October 2014 to September 2018, the project is composed of five large-scale demonstration projects, each of which is focused on increasing network capacity and system flexibility and incorporating innovative transmission systems for long distance interconnections.

Interestingly, the fifth of the projects will be a demonstration of superconducting lines as an innovative approach to long distance electricity transmission.

Superconductivity is the phenomenon that happens when some electrical conductors are cooled down to very low temperatures, triggering the transmission of electricity without any resistive losses. This is a significant advantage: in the case of conventional technologies, power losses range from 2 to 5 per cent for a typical high-voltage direct current (HVDC) overhead line, and can be as high as 10 per cent for HVDC underground cables. 'Lossless' electricity transmission would translate into increased profitability and less wasted energy.

Nexans is one of the key players in the fifth (Demo 5) Best Paths project. At a recent roundtable in London, UK, Dr Christian-Eric Bruzek, Project Manager of superconductor activity at Nexans, shared his views on the role of superconductors in the energy transition.

Commenting on the possibilities for solar and onshore wind, he said: "If a wind or solar plant, produces, for example, 50 per cent of its potential power output on average, deciding how to handle twice the power output on a sunny or windy day can be a challenge for a TSO. This is why you need a more flexible link to handle the variations caused by the weather."

The goal of the FP7 project is now to progress further along the research and development path by making a demonstrator cable that will be tested in operational conditions. Parallel studies will investigate the integration of superconducting lines into existing grids, as well as the possible social and economic impacts of this technology.

The Best Paths Demo 5 project, led by Nexans, has 10 partners. Germanys' Institute for Advanced Sustainability Studies (IASS) Potsdam is in charge of the scientific coordination of the research field dedicated to demonstrating the technical feasibility of integrating DC superconducting lines using magnesium diboride (MgB_2) as the critical material.

Nexans, European Organization for Nuclear Research (CERN) and Columbus Superconductors will be responsible for the optimisation of MgB_2 wires and conductors. Nexans will also supply the cables, cryogenic machines and handle integration of the system into the grid.

"The idea of the project is to see whether we are ready to inject large amounts of bulk power from the renewable farms," noted Dr Bruzek.

This part of Best Paths aims to develop cable and termination manufacturing processes for HVDC monopole superconducting cable capable of transferring up to 3 GW (6 GW for bipolar), as well as to develop/optimise manufacturing process for production of a large quantity of high performance MgB_2 superconducting wires at low cost.

Project participants will validate cable operations through laboratory experiments; demonstrate operation of a full-scale cable system demonstrator able to transfer up to 3.2 GW and propose system integration pathways for HDVC applications in the grid. If successful, it will be the first time that this much power is transferred at 320 kV.

The demonstrator will operate at 10 kA and be approximately only 20 m in length. Nexans says, however, that the cables would be able to span a distance of about 10 km between the cryogenic machines for the liquid nitrogen used for high voltage insulation and the helium gas for the MgB_2 conductor. According to Dr Bruzek, the project will study applications to eliminate network bottlenecks, where superconducting lines would span 5-10 km.

It will also investigate very long lengths to transfer power across European countries in the future. "This will probably require the acceptance of [the transport of] liquid hydrogen and things like that, so it will take time. But this is in the scope of this project," noted Dr Bruzek.

Superconducting cable is certainly a new tool that could change the electrical network and improve the efficiency in a world becoming increasingly urban with less centralised electricity production.

RWE's AmpaCity project, which officially began operation at the end of April last year, could herald a whole new dimension in the restructuring of inner-city networks. The cable spanning a length of 1 km, connecting two substations in Essen's city centre, is the longest HTS in the world. The 10 kV cable produced by Nexans is designed for a transmission capacity of 40 MW.

The lightweight and compact nature of systems using superconductors could also see them being applied on board cruise ships and LNG tankers as well as in the electrical or hybrid passenger planes of the future aimed at cutting CO_2 production by 50 per cent per passenger in 2020.

Dr Bruzek summed up: "We have developed all the elements to build superconducting links adapted to many applications for the environmental challenges of today and tomorrow. Superconducting cables are drivers for the energy transition."

Superconducting development

Superconductors have a huge current transport capacity: at least 150 times larger than copper. They provide a new way to solve power transmission (voltage x current) issues by increasing the current rather than the voltage. Today, current throughput is limited to about 2000 A; superconductors allow currents of up to 5 kA AC or beyond 20 kA DC.

Superconductivity was first discovered in 1911 using mercury. However, a useable superconductor was not made until the 1960s using niobium-titanium wires cooled by liquid helium.

The breakthrough has driven the development of magnets for use in equipment such as MRI scanners operating at a temperature of 4.2 K. Today, this is a €5 billion market.

The next advance came in 1986 with the discovery of a new material that allowed high temperature (77 K) superconductivity (HTS). This enabled low cost, widely available and environmentally friendly nitrogen to be used for cooling instead of helium.

Since then, work has been ongoing to develop new HTS materials in order to reduce the cost of superconducting wires. First generation HTS wires use significant amounts of silver, resulting in high costs. Even second-generation tapes, which manage to replace silver by using a copper oxide-based HTS layer are still a factor of four or five times higher than the target price for long distance power transmission.

The wire to be demonstrated in the EU Best Paths projects aims to use a multi-filament magnesium diboride (MgB_2) wire that is 50 times cheaper than existing HTS wires. However, this wire operates at below 40 K, which means liquid hydrogen or gaseous helium would have to be used for cooling. Nexans notes, however, that the cheap cost of the wire more than compensates for the extra cost of cooling.

Costs for 3000 km length cable with 10 GW capacity

Capital costs	**MgB_2 LH_2 cable**	**MgB_2 GHe + LN_2 cable**	**HTS[1] cable**	**±800kV HVDC[2] OHL**	**±320kV HVDC[3]** cable
Installed capacity [GW]	10.21	10.14	10.13	10.75	12.32
Transmission line, [M$/(10 GW x km)]	2.49	4.23	7.64	4.04	14.27
Transmission line costs [M$]	7631.53	12 863.89	23 211.88	13 023.13	52 749.45
Converter [M$]	4083.03	4067.88	4066.26	4191.06	4508.75
Total capital costs [M$]	**11 700**	**16 900**	**27 300**	**17 200**	**57 300**

Notes:

[1] EPRI (2009) [2] ABB (2009) [3] BMU-Study HVDC-cables (2012)

Source: *Superconductivity project at IASS*, by Heiko Thomas, EPRI 11th Superconductivity Conference, 30th October 2013

Storing up innovation

The International Energy Agency's *Energy Technology Perspectives* (ETP) 2015 says that fostering innovation of low-carbon products and processes is essential to meeting global decarbonisation goals. Notably, ETP 2015 includes the annual *Tracking Clean Energy Progress Report*, which for the first time looks at progress in storage and hydrogen technology. ***TEI Times*** extracts some of the highlights.

With climate change negotiators working towards a global agreement on climate change in Paris at the end of this year, 2015 could mark a turning point in global climate action.

But as Paris looms there is a long way to go – not just in terms of negotiating an agreement but also in terms of achieving climate change targets. In May this year, the International Energy Agency (IEA) released its 'Energy Technology Perspectives (ETP) 2015' report. The report noted that despite a few recent success stories, clean energy progress is falling well short of the levels needed to limit the global increase in temperatures to no more than 2°C.

According to the IEA it will be challenging for the world to meet its climate goals solely through the UN negotiation process, which leaves the development and deployment of new, ground-breaking energy technologies as key to mobilising climate action.

This year's ETP provides a detailed analysis of long-term trends in the energy sector, centred on the technologies and the level of deployment needed for a more environmentally sustainable, secure, and affordable energy system.

It also includes the annual 'Tracking Clean Energy Progress' report, which for the first time looks at progress in storage and hydrogen technology. Commenting on the inclusion, IEA Executive Director Maria van der Hoeven said: "…accelerating the deployment of existing technologies that still have some potential for innovation is important. It is not a coincidence that this year we have added storage and hydrogen to the energy technologies we look at as part of our Clean Energy Tracking Report."

According to the report, large-scale energy storage capacity reached more than 145 GW globally in 2014, of which 97 per cent was accounted for by pumped hydro storage. The rapid penetration of wind and solar PV, however, is driving the growth of other storage technologies.

Storage is expected to contribute to meeting the 2°C scenario, or 2DS, targets by providing flexibility to the electricity system and reducing wasted thermal energy. IEA figures show that between 2005 and 2014 there was a significant increase in the deployment of large-scale batteries (120 MW to 690 MW) and thermal energy storage (250 MW to 2420 MW).

While forecasts vary, it is expected that the demand for energy storage will continue to grow in line with the increase in intermittent renewables. Bloomberg Renewable Energy Finance puts the figure at 11 GW by 2020 while IHS estimates there will be 40 GW of storage in 2022. Meanwhile, the potential manufacturing capacity that could be delivered is as high as 130 GW (AES Storage, 2014) in 2024.

Increasing volumes spurred by greater demand has seen notable reductions in the cost of large-scale batteries. ETP 2015 notes that the cost of lithium batteries for grid-scale storage for frequency regulation has shown the biggest fall, tumbling more than three-quarters since 2008 to reach about $600/kWh in 2013. This cost reduction was accompanied by a 250 per cent increase in the cycle times of these batteries, from 2000 cycles in 2008 to 5000 in 2013.

While many governments have been supporting energy storage through varying policies, high costs continue to be an obstacle to greater deployment.

The IEA therefore recommends several actions. It says investments are required in R&D for early-stage energy storage technologies. Technology breakthroughs are needed in high temperature thermal storage systems and scalable battery technologies, as well as storage systems that optimise the performance of energy and facilitate the integration of renewables, says the report.

ETP 2015 states that "it is vital" to develop marketplaces and regulatory environments that accelerate storage deployment. Pricing distortions need to be eliminated, it says, with storage systems being remunerated for providing multiple services over their lifetime.

The report also recommends that policymakers support assessments of the value of storage in specific regions and energy markets. "They should also promote the development and adoption of tools devoted to evaluating energy storage project proposals", it states.

One interesting development in July saw the European Union agree to provide 'Connecting Europe Facility' (CEF) financing of up to €6.47 million for Gaelectric's compressed air energy storage (CAES) project near Larne in Northern Ireland.

The project, which has already been included as a Project of Common Interest (PCI) under the EU programme to promote transboundary energy infrastructure, will store energy in the form of compressed air in specially engineered caverns created within geological salt deposits for this purpose.

Commenting on the project, the CEF Co-ordinating Committee said: "The PCI (Project) would contribute to market integration, renewable energy input and system security in both Ireland and the UK (Northern Ireland)… The project is technologically innovative and has the potential to be replicated in other parts of the EU with suitable geological conditions."

As CAES, batteries and other storage technologies continue to gain traction, the IEA also highlights the potential presented by a hydrogen economy.

Hydrogen is a flexible energy carrier with potential applications across all end-use sectors and is well suited to storing large quantities of energy for long time periods, such as low carbon electricity.

According to ETP 2015, around 8 GW of electrolysis capacity is installed worldwide, accounting for about 4 per cent of global hydrogen production. Alkaline electrolysers are the most mature technology and are commercially available, while proton exchange membrane (PEM) and solid oxide electrolysers have greater potential for cost reductions and efficiency improvements.

Electrolysers are highly modular systems, which make them very flexible in terms of output capacity but also limits the effects of economies of scale, as even large electrolysers are based on identically sized cells and stacks.

According to the US DOE's 2013 'Fuel Cell Technologies Market Report', between 2008 and 2013 the global market for fuel cells (FCs) grew by almost 400 per cent (shipped units), with more than 170 MW of FC capacity added in 2013.

ETP 2015 revealed that currently more than 80 per cent of fuel cells are used in stationary applications, such as FC micro-cogeneration, back-up and remote power systems. While the US ranks first in terms of added fuel cell power capacity, Japan ranks first in terms of delivered systems, due to the successful upscaling of the Japanese EneFarm micro fuel cell cogeneration system.

Although many hydrogen and FC technologies are still in the demonstration phase, some, such as PEM electrolysers, are close to early adoption. The IEA says the use of PEM electrolysers at capacities of several megawatts, to generate hydrogen from otherwise curtailed low-carbon electricity, needs to be brought forward to finally prove the economic feasibility of large-scale and long-term energy storage systems and power-to-gas systems.

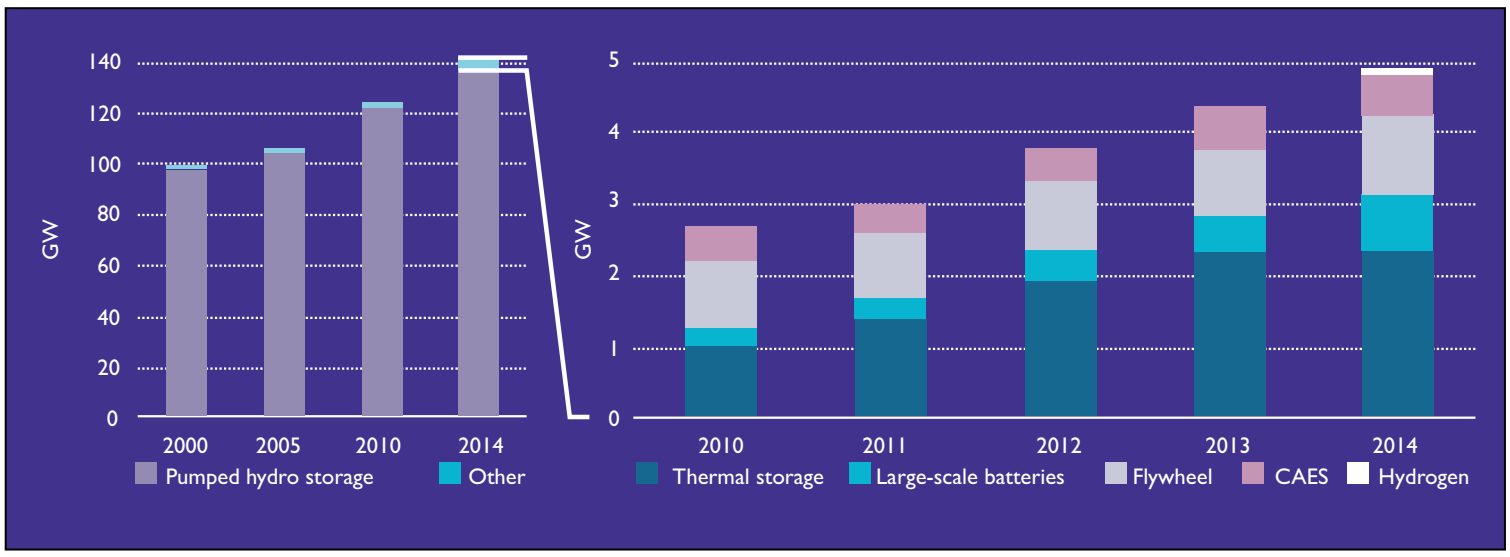
To foster the uptake of hydrogen as an energy carrier, the IEA says it is imperative to sustain RD&D, for transportation and stationary applications as well as for hydrogen storage, production and delivery.

ETP 2015 also says "further support is needed for research that quantifies benefits and challenges of energy system integration, to enable better understanding of the application of hydrogen technologies in a broader energy system context".

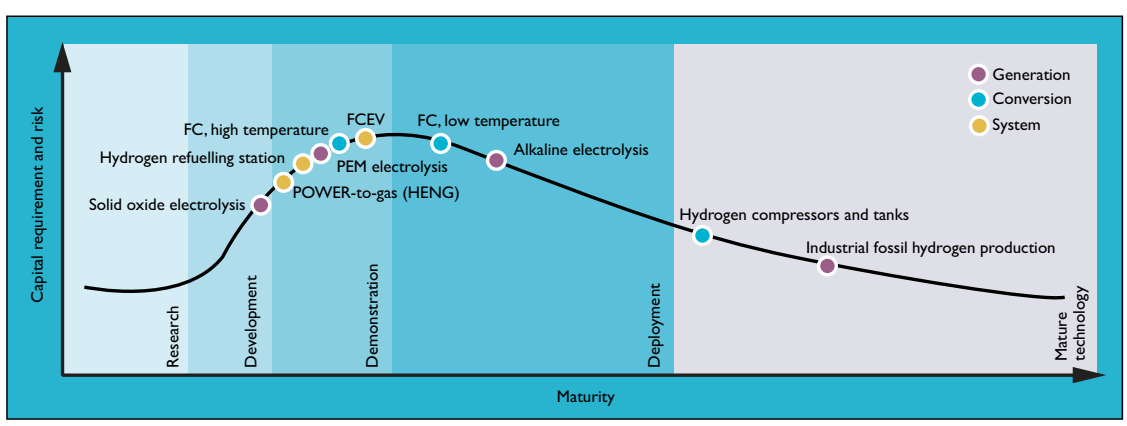
Speaking at the launch of the report, Didier Houssin, the IEA's former Director, Sustainable Energy Policy and Technology said: "Long term support can attract innovation investment more effectively than one-off fiscal instruments such as tax rebates."

He concluded: "Innovation has an important role to play for COP21 and a better understanding of innovation can certainly lead to more effective outcomes at the conference."

Installed capacity for grid connected energy storage.
Source: Energy Technology Perspectives 2015, Tracking Clean Energy Progress © OECD/IEA, Paris, Figure. 2.55, page 117



Maturity of hydrogen technologies and systems.
Source: Energy Technology Perspectives 2015, Tracking Clean Energy Progress © OECD/IEA, Paris, Figure. 2.58, page 119



Europe's circular economy in action

Research from Outotec and Stuttgart University, supported by KIC InnoEnergy, shows that green energy and nutrient recovery provide powerful incentives to explore and commercialise innovative solutions for processing and converting Europe's sludge and slurry mountain. ***TEI Times*** investigates

The potential of sewage sludge and farmyard slurries for energy conversion has long been recognised, if not yet fully realised. To date, the biggest barrier has been the moisture content. At typically 90 per cent it precludes combustion in traditional incineration plants and presents the logistical problem of transporting wet waste. The costs of both have, in large part, reduced the commercial viability of such waste for all but the most specialist areas.

Nonetheless, there is a palpable sense of lost potential that colours discussions regarding biomass conversion in general and farmyard waste in particular. The European market alone produces a total of 140 million tonnes of slurry measured in dry substance, which is concentrated in the livestock-intensive regions of northwest Europe.

For sewage sludge and slurry to be considered a reliable fuel source for power generation, efficient moisture extraction is essential. However, the same principles apply to forestry and timber waste and the manufacture of wood pellets for fuel – as separate teams at Outotec, the Finnish engineering and material sciences company, discovered.

The company's researchers at its Frankfurt site were considering the potential of wet biowaste, while colleagues in Skellefteå in Sweden were working on a dryer concept for wood-based feedstocks. When the two teams compared projects, it became clear that there was mutual benefit to joining efforts and finding a common solution.

However, the two research teams from Outotec soon realised that drying was in fact the first stage of a two-phase process. Ludwig Hermann, commercial product manager for metals, energy and water at Outotec in Frankfurt explained: "The Frankfurt team had been looking at the potential of biowaste and generating energy from chemical fuels for some time. Working together with our colleagues in Sweden, we developed a proposition that, in addition to producing dried mass for combustion in mixed or specialist generation plant, could apply gasification techniques to produce more universally applicable synthetic fuel gas."

From this proposition, the Demonstration of Efficient Biomass Use for the Generation of Green Energy and Recovery of Nutrients project, or 'DeBugger', was born.

The first element in the project is the design of a closed-loop steam dryer, developed from the original idea of Outotec's Swedish researchers. The second element is a gasification plant. The plant features a dual-circulating fluidised bed gasifier, which is used for the thermal treatment of the dried substrate to produce synthetic fuel gas.

"There is a clear logic to developing these solutions in tandem," explained Hermann. "The gasification process requires a dry feedstock, so the drying process is essential. However, a percentage of the gas produced by the gasifier can be used to power the dryer. Once in production, it's a very efficient energy-conversion unit."

Whereas a typical drying plant would require 800 kWh to evaporate a tonne of water, initial tests conducted by Hermann and his team showed that the DeBugger dryer would use less than half that amount. "Compared to the process for evaporating water from wet biomass or the effluents of traditional anaerobic digestion plants, this is a very carbon- and cost-effective system," said Hermann. "What's more, by producing gas fuel rather than solid fuel, it can provide the feedstock for a far greater number of non-specialist power generation plants. It has a far more universal application than standard combustion processes."

Interestingly, the key drivers towards commercial adoption of the DeBugger dryer and gasifier are likely to be found in more stringent directives on land use, as well as stricter enforcement of existing directives on the use and recovery of nitrates, and forthcoming legislation in Germany and Switzerland mandating phosphorous recovery.

Current means of disposing of sludge and slurry present two distinct problems. The first is that incineration, whether in mixed combustion plants, cement kilns or municipal incineration facilities, dilutes nutrients such as phosphates to the point that they are beyond recovery. Agriculture thus loses valuable sources of soil enrichment.

The alternative solution of spreading excessive amounts of manure on fields, creates exactly the opposite problem: over-fertilisation of soils and eutrophication (over-nutrition) of inland and coastal waters, which produces algal blooms that damage delicate ecosystems, while diverting valuable nutrients away from crop-growing.

With greater controls in place regarding phosphate recovery, it is almost impossible to incinerate this form of biowaste in power plants converted for co-incineration of biomass. However, the DeBugger gasification process leaves a concentrated, nutrient-rich solid residue, it overcomes the problems of nutrient recovery and enables compliance with more stringent regulation.

Hermann and his team see this as a secondary market and an important element in the commercialisation of their prototypes. "Certainly synthetic gas fuel is the primary output, but the beauty of this closed loop system is that by recycling plant nutrients for controlled fertilisation in agriculture it has a much wider environmental application," he said. "It expands the commercial possibilities for municipal utilities and others who wish to adopt it."

In fact, Hermann sees their project as a pioneer for the recently launched EU Circular Economy. "There is a growing sense within Europe that future economic growth will involve, to some extent, more products being manufactured from secondary raw materials. Indeed, waste can be considered a valuable resource. This requires business models that retain physical goods for longer and keep them in efficient productive use for longer. It's also going to raise the profile of solutions like ours, and the role they can play in delivering environment, economic and even social benefits. This focus on the circular economy couldn't have come at a more favourable time for us."

The DeBugger project has established a clear path to commercialisation. Initial concepts and early stage research evolved into a project that is now supported by KIC InnoEnergy, the organisation founded by the European Institute of Innovation and Technology (EIT), to support the development and commercialisation of sustainable energy solutions in Europe.

"DeBugger's sustainability credentials have always been strong," said Dr. Christian Müller, CEO of KIC InnoEnergy in Germany. "Firstly, despite the underlying complexity of the technology, the project actually offers a relatively simple proposition for addressing two complementary but separate environmental challenges. Secondly, it is perfectly aligned with the need for more diversification and sustainability in power generation for Europe. And thirdly, it demonstrates the often-overlooked role that energy from chemical fuels can play in any future energy mix."

Müller also believes that DeBugger's strength comes from its commercial prospects. "We invest in projects we believe will come to fruition and make a difference," he said. "One of the stand-out features of the DeBugger project is that it doesn't just serve a niche market: this is a technology with broad application that serves two distinct industry sectors, boosts the return on investments made in mixed combustion plants, and enables biomass use in unconverted gas-fired plant. However you look at it, there will be demand for their product."

Financial support from KIC InnoEnergy has enabled the Swedish team to commission the first prototype of the dryer and conduct a series of comprehensive tests into its functionality, the feeding system, the steam parameters, and the reliability of the system in a commercial setting. The first pilot, with a capacity of several hundred kilograms per hour, was unveiled at a wastewater treatment plant in Skellefteå, Sweden earlier in the summer.

KIC InnoEnergy also introduced the project team to researchers at the University of Stuttgart, one of its academic partners, and one of the leading research institutions for the type of double-fluid gasification process used in the DeBugger gasifier. Researchers at Stuttgart and Outotec are looking at the impact of different feed stocks, such as sludge, manure, or chicken litter how they behave in the system, and the quality of the gas they produce.

"We know that sewage sludge and manure can produce fuel gas that has similar qualities as gas produced from forest residues; and we know that we can achieve that at higher gasification temperatures. What we need to investigate is what happens at lower temperatures," explainsed-Hermann. "We can gasify at 650 degrees rather than 850, for example, but we want to understand more about what that does to the quality of the end product."

Research is also continuing into the quality of solid residue for use in controlled fertilisation. Hermann points out that the double-fluid test bed system means that the separation of contaminants from solid residues is a possibility, which the team believes has positive implications for the usability of the end-product, as well as the synthetic gas produced.

The company is already in discussions with a number of municipal utilities and private companies willing to act as a test bed.

"We're in the interesting stage between R&D and full implementation," explained Hermann. But we believe the proposition is a strong one. We believe the benefits are clear. And we are on course to have proofs of concept up and running by the second half of this year. Our goal remains full commercialisation before the end of 2016."

A combined heat and power plant in Storuman, Sweden, burns forest residues. The same principles for moisture extraction can be applied to sewage sludge and slurry

Fifty shades of grey

Junior Isles

The British government has once again got itself into a bit of a bind. Its recent move to slash renewable energy subsidies has brought an outpouring of criticism from industry and environmental groups – perhaps not so much because of what is being done but more because of how it is being done and the backdrop against which it comes.

When Prime Minister David Cameron came to office in 2010 he said he wanted the then coalition administration to be "the greenest government ever" – how political rhetoric can come back to bite.

Perhaps without memory of such a bold statement, the government's announcements last month may not have been met with such a backlash.

John Sauven, Greenpeace Executive Director said: "Since the election, we are now moving from the 'greenest government ever' to the 'greyest government ever'.

"This is not the mandate this government put to the country in the general election. And it will be a hard sell to the international community at the climate talks in Paris at the end of the year. Without any real domestic action to tackle climate change this government will lose any credibility to influence others."

Others echo the sentiment that the moves cast a grey cloud ahead of crucial climate change negotiations. Richard Kirkman, UK technical director of Veolia, the French waste and water company said they amount to an abrupt setback for renewable investors just months before the COP21 climate change conference in Paris.

"We appear to be entering another dark age where we will return to total fossil fuel reliance, power cuts [and] low confidence in UK investment," he said.

> "I believe we've been the greenest government ever and we've made great pledges in the last parliament which we've kept

From green to "grey" to "dark" – such statements are perhaps a touch dramatic. Although disappointing for many, the government's attempt to bring costs under control is understandable, even if the execution is debatable. The decision comes at a time when bill payers are struggling and the Chancellor is under pressure to deliver on budget promises.

Financial support for renewable technologies primarily comes in the form of subsidies that are paid for via energy bills. The total amount of subsidies available is capped via a mechanism called the Levy Control Framework (LCF).

The Office for Budget Responsibility's latest projections, however, show that subsidies raised from bills are currently set to be higher than expected when the schemes under the LCF were set up.

A cap on the total amount available was supposed to reach £7.6 billion ($11.8 billion) by 2020-2021. But officials said they discovered this year that so many wind and solar projects were being built that the cap was likely to reach £9.1 billion, therefore action was needed to prevent higher costs.

In late July the government thus announced several measures to rein in the rising cost of renewable subsidies.

It plans to remove the guaranteed level of subsidy for biomass conversions and co-firing projects. Officials said the move to limit biomass subsidies could prevent a £500 million rise in the LCF by 2020.

A consultation is being launched on controlling subsidies for solar PV installations of 5 MW and smaller under the Renewables Obligation (RO). This includes consulting on closing the RO in April 2016, a year earlier than planned, and removing the guaranteed level of subsidy for the duration of the RO.

Reacting to the news Leonie Greene, the Solar Trade Association's (STA) Head of External Affairs said: "This is damaging for big solar rooftops as well as solar farms, both very cost-effective ways of generating solar power. This contrasts with repeated commitments from government to boost the commercial solar rooftop market."

The government will also undertake a broad review of the Feed-in Tariff (FIT) scheme in an effort to drive further savings. One outcome of the review is that the level of financial support for medium-scale onshore wind projects would no longer be guaranteed in advance.

RenewableUK's Chief Executive, Maria McCaffery said: "The renewable energy industry is ahead of the government in its desire to bring down costs – these have fallen dramatically and will continue to plummet. Onshore wind is already cheaper than new nuclear power and is on course to be cheaper than new gas by 2020… Removing certainty will worry energy investors and can only increase the cost of developing renewable projects."

DECC has postponed vital announcements on Contracts for Difference (CfD) until at least the autumn, a move that could damage Scotland's offshore wind and island renewable energy projects.

Scotland's Energy Minister Fergus Ewing commented: "The UK government promised that they would end the lack of clarity about the future of renewables, that they would deliver a clear statement of policy towards 2030 and how they will maintain and achieve their climate targets.

"They have decided to delay the announcement which was promised for this month for an indefinite period, and I fear that that will directly affect jobs and investment in Scotland… this decision will once again have a damaging impact here…"

Defending the plans, Energy and Climate Change Secretary Amber Rudd said: "My priorities are clear. We need to keep bills as low as possible for hardworking families and businesses while reducing our emissions in the most cost-effective way."

The STA argues, however, that support for solar under the RO currently costs just £3 per year on each household bill.

Yet Cameron still insists the Conservatives have been the greenest government ever. And in truth there is some merit in that claim. His administration has done a great deal for the environment and renewable energy.

Hitting back at his critics, Cameron said: "I believe we've been the greenest government ever and we've made great pledges in the last parliament which we've kept – like the world's first green investment bank, which is spending billions of pounds investing in green energy.

"We have seen a massive increase in investments in renewable energies... we are now close to having 10 per cent of our electricity needs being met by onshore wind. We have the world's largest off shore wind market."

There are those who support the government's recent moves. Centre for Policy Studies Research Fellow Rupert Darwall said Rudd's statement to the energy and climate change select committee that meeting carbon reduction targets is 'more important than renewables targets' is the "first big step back to energy policy sanity".

He said: "The energy secretary has grasped the nettle that more renewables mean higher electricity bills. Spiralling electricity bills are not politically sustainable. However her announcement will increase the risk premium demanded by renewable investors. Already there is a dearth of investment in new capacity required to keep the lights on when the weather isn't producing enough electricity to meet Britain's needs. In reality, there are two choices – use the government's balance sheet to remove the political risk premium charged by the private sector or return the electricity sector to the market."

Balancing the national budget while protecting consumers and ensuring adequate levels of private investment will always be a tough balancing act.

The government should not be criticised for cutting subsidies but the industry is rightly aggrieved when policy is inconsistent.

Michael Grubb, Professor of International Energy and Climate Change Policy at University College London, said the announcements over the past few weeks were retrospective changes that inject uncertainty and drive away investment.

"The entire energy industry is now concerned about the risk of a capricious and politicised UK energy policy, driven more by Treasury intervention than by the Department responsible."

As McCaffery put it: "This announcement is yet another hand brake turn on energy policy… We need the industry and government to agree on a long term strategy with financial support being reduced gradually and appropriately over a clearly set out timescale – not short-term changes coming out of thin air."

When bonds are broken and the industry is forced into submission by an increasingly dominant government, perhaps seeing the administration as shades of grey is maybe not so wide of the mark after all.