THE ENERGY INDUSTRY TIMES

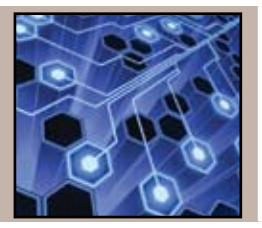
March 2015 • Volume 8 • No 1 • Published monthly • ISSN 1757-7365 www.teitimes.com

How smart is Europe?

Smart meters are being rolled out across Europe but what's in it for consumers and utilities?
Page 13

Making a case for storage

Utilities can take advantage of storage now – it's just a case of finding the right economic model.
Page 14



Final Word

CCS takes a count but this fight isn't over, says Junior Isles
Page 16

News In Brief

European Parliament compromises on ETS reform
The European Parliament has backed the introduction of a Market Stability Reserve to boost carbon prices.
Page 2

EPA's Clean Power Plan no threat to reliability
Concerns that the US Environmental Protection Agency's Clean Power Plan is a threat to the US electric system security are largely overstated, according to two recent independent reports.
Page 4

Australia favours solar over wind
Government plans to reduce renewable support are a big threat to wind but large-scale solar projects still look promising.
Page 6

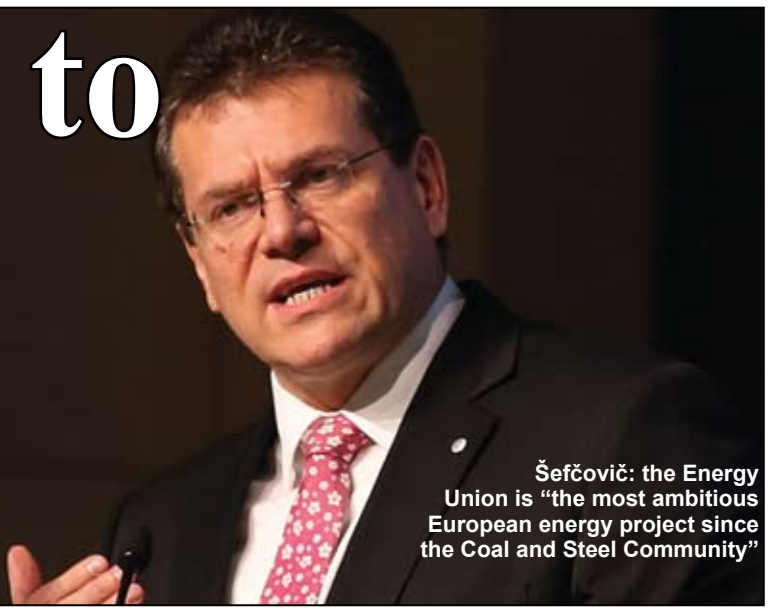
Shale gas progress falters in Europe
The prospects for the widespread development of a shale gas industry in Europe have faltered in spite of attempts by industry and some governments to kick-start exploration.
Page 7

Vattenfall restructures
Vattenfall is to implement a new organisational structure and executive management team as part of wider plans to review its strategy and address current market challenges.
Page 10

Fuel Watch: BP Energy Outlook 2035
Demand for natural gas over the next 20 years will rise fastest among fossil fuels, mainly driven by growing consumption in non-OECD countries.
Page 11

Technology: Lünen could answer several utility problems
The energy landscape has changed dramatically in recent years with many of Europe's energy companies being squeezed from all angles. A technology to be demonstrated at a pilot project in Lünen, Germany, could potentially answer their problems.
Page 15

EU moves to address energy trilemma



Šefčovič: the Energy Union is "the most ambitious European energy project since the Coal and Steel Community"

The EU's new 'Energy Union' strategy could improve EU energy independence while meeting long term climate goals in a cost-effective manner. **Junior Isles**

The energy industry and politicians have largely welcomed the European Commission's recently published 'Energy Union' strategy.

The Energy Union has been drawn up to set a new direction and a clear long-term vision for European energy and climate policy. It is seen as a fundamental step towards the completion of a single energy market and reforming how Europe produces, transports and consumes energy.

Three key documents were published by the Commission in late February:

- A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy that sets out, in five interrelated policy dimensions, the goals of an energy union – and the detailed steps the Juncker Commission will take to achieve it. Among other things it includes new legislation to redesign and overhaul the electricity market, ensuring more transparency in gas contracts; substantially developing regional cooperation as an important step towards an integrated market, with a stronger regulated framework; new legislation to ensure the supply for electricity and gas; increased EU funding for energy efficiency or a new renewables energy package.
- An Interconnection Communication, setting out the measures needed to achieve the target of 10 per cent electricity interconnection by 2020, which is the minimum necessary for the electricity to flow and be traded between Member States. It shows which Member States currently meet the target and which projects are necessary to close the gap by 2020.
- A Road to Paris Communication, setting out a vision for a global climate agreement in Paris in December. The vision is for a transparent, dynamic and legally binding global agreement with fair and ambitious commitments from all parties. The Communication also translates the decisions taken at the European Summit in October 2014 into the EU's proposed emissions reduction target (the so-called Intended Nationally Determined Contribution, or INDC) for the new agreement.

The documents were published against a backdrop that shows the high

Continued on Page 2

Plenty to do despite early wrap-up at Geneva climate talks

Climate change negotiators made good progress at a recent climate change conference in Geneva, concluding talks two days ahead of schedule. However, much of the hard work still lies ahead.

The six-day conference ended last month with an agreement on a formal draft negotiating text for the crucial COP21 summit in Paris in December. It was the first formal climate meeting since the summit in Lima, Peru, in December 2014.

The 86-page document builds on the Lima negotiations and covers issues ranging from climate change mitigation, adaptation, finance, technology and capacity-building.

Christiana Figueres, Executive Secretary of the United Nations Framework Convention on Climate Change (UNFCCC), said: "We now have a formal negotiating text, which contains the views and concerns of all countries. The Lima Draft has now been transformed into the negotiating text and enjoys the full ownership of all countries."

Tasneem Essop, WWF's head of delegation to the UNFCCC noted, however, that while the chairpersons at the Geneva conference "deserve credit for their approach at the session and getting a party-owned draft text agreed, tackling the difficult issues" is yet to begin.

She said: "Our perception is that traditional fault lines have not yet been breached. Negotiators face a tremendous task to reach agreement on the contentious issues and come up with an ambitious, fair science-based deal in the two or three negotiating sessions left before meeting in Paris."

She said that the first test of political will and influence inside the negotiating process will come in the period from March to June when countries announce their plans to reduce emissions and, it is hoped, provide financial resources for the post-2020 period.

In a show of political will, leaders from the UK's three main parties last month took the rare step of signing a cross-party pledge to combat climate change whatever the result of the May general election.

The next step for climate negotiators is to reach consensus on the content of the new climate deal. Formal negotiations on the text will continue in Bonn, Germany in June.

Some of the key issues that are yet to be agreed include how governments can scale up pre-2020 actions, the application of the convention principles related to differentiation; securing the scale of finance required in both the pre-2020 and post-2020 periods and ensuring that a new global climate regime provides security for those most vulnerable to climate impacts.

To avoid the most dangerous impacts of climate change, countries have already agreed that the global temperature rise should stay below 2°C (3.6°F), compared to pre-industrial times. However, many want the Paris deal to state more specifically what that actually means in terms of emissions cuts.

Some say the Paris agreement should incorporate the UN climate science panel's finding that to have a two-thirds chance of staying below 2°C the world must cut emissions by 40-70 per cent by 2050. Others want to go further, calling for net zero emissions by mid-century.

Figueres said it is already clear the combined pledges will not match what scientists say is required to avoid dangerous warming, meaning deeper cuts have to occur in the future.

"What Paris does is to chart the course toward that long-term destination," she told reporters in a webcast briefing.

- Industrial countries taking part in the 1997 Kyoto Protocol on climate change reduced their total greenhouse emissions by around 23 per cent from the 1990 base year at the end of their first commitment period to 2012, far beyond the 5 per cent target, according to the UNFCCC.

THE ENERGY INDUSTRY TIMES is published by Man in Black Media • www.mibmedia.com • Editor-in-Chief: Junior Isles • For all enquiries email: enquiries@teitimes.com

Continued from Page 1

dependence of the bloc on energy imports. According to the Commission, the EU is the largest energy importer in the world, importing 53 per cent of its energy, at an annual cost of around €400 billion. It also notes that six EU member states (Bulgaria, Estonia, Finland, Latvia, Lithuania, Slovakia) are dependent on one single external supplier for all their gas imports.

In unveiling the strategy, Maroš Šefčovič, the Vice-President responsible for the Energy Union said: "Today, we launch the most ambitious European energy project since the Coal and Steel Community. A project that will integrate our 28 European energy markets into one Energy Union, make Europe less energy dependent and give the predictability that investors so badly need to create jobs and growth.

"Today, we set in motion a fundamental transition towards a low-carbon and climate-friendly economy, towards an Energy Union that puts citizens first, by offering them more affordable, secure, and sustainable energy."

According to the Commission, better energy connections across the European Union can save EU energy users up to €40 billion per year.

"Europe is losing up to €40 billion a year by not having a fully connected energy market," Climate Action and Energy Commissioner Miguel Arias Canete said.

Canete added he was releasing a "country-by-country plan" to achieve a goal of ensuring cross-border links equate to at least 10 per cent of a nation's power generation capacity by 2020.

Commenting on the strategy, Richard Black, director of the Energy and Climate Intelligence Unit (ECIU) said: "The EU's draft international climate pledge doesn't contain any surprises – essentially it is taking what EU governments decided to do back in October, and putting that package of measures and targets forward into the UN climate convention.

"The Energy Union proposals are a bit more interesting and show that in principle the EU doesn't want to continue with an electricity system dominated by fossil fuels, but switch to the kind of flexible smart low-carbon grid being pioneered in Germany, which should lead to a cheaper and more secure system that's less dependent on Russia."

The wind and solar sector also largely welcomed the initiative. Thomas Becker, CEO of European Wind Energy Association (EWEA) said a new directive for beyond 2020 shows that renewables will have a central role to play in Europe's future energy mix.

He said: "These are positive signs coming out of the Commission. We're seeing recommendations for a shift away from a fossil fuel-dominated economy to more sustainable, secure and decarbonised sources of energy."

Frauke Thies, Policy Director at European Photovoltaic Industry Association said that now "the Commission should follow up words with action".

Green members of the European Parliament, however, were more critical, saying the Commission is seeking to invest in new pipelines to diversify gas providers when wind and solar were the obvious way to increase security of supply.

Luxembourg Green politician Claude Turmes said the Commission was stimulating massive new investment in gas infrastructure instead of truly "questioning Europe's insane fossil fuel import dependency".

European Parliament compromises on ETS reform

The European Parliament has backed the introduction of a Market Stability Reserve (MSR) to boost carbon prices. But although the vote would see the MSR start earlier than the European Commission's proposal, some argue that it does not come soon enough. **Junior Isles**

The European Parliament's decision to back plans for a carbon market stability reserve to shore up carbon prices in the European Emissions Trading Scheme (ETS) has been welcomed by industry, although many hoped that reform of the scheme would come into effect sooner.

European politicians voted on February 24, to start reforms to bolster prices on the EU's ETS by the end of 2018, earlier than the European Commission's proposal of 2021.

Under the reform the EU plans to take hundreds of millions of surplus carbon allowances out of the market and place them in a so-called Market Stability Reserve (MSR). It would put them back into circulation if demand rises.

Although earlier than the Commission's proposal, member states Britain and Germany, which want to boost investment in low-carbon power generation, had hoped it would start by 2017. They were backed by utilities such as Germany's E.On.

Traders said the market reacted negatively to the outcome of the vote because there had been hopes that reforms to the world's largest carbon market would begin earlier. Benchmark carbon prices fell by 1.2 per cent to €7.67 per tonne on the announcement of the vote.

The environment committee vote in the European Parliament still needs to be followed by a vote of the full assembly and must be endorsed by EU member states to become law.

The environment committee has mandated Ivo Belet, who is steering the market fix through the EU Parliament, to start talks with member states on the final version of the draft law. National governments may agree on their negotiating position in the coming weeks.

Commenting on the vote, Sandrine Dixson Declève, Director of The Prince of Wales's Corporate Leaders Group, said: "We knew a political compromise was necessary. This is therefore a step in the right direction but it still falls short of the strides Europe should be taking to incentivise low-carbon investment decisions by business sooner rather than later.

"Our members call upon the Council of the European Union to listen to the overwhelming business consensus and introduce the MSR earlier than December 2018 to balance out the carbon market as soon as possible."

To help allay concerns by energy-intensive industries over the possibility of rising carbon prices, lawmakers agreed to make 300 million unallocated allowances available from 2018-25 for an innovation fund. The committee also called for a review of provisions on "carbon leakage", caused by businesses that move to non-EU regions without emission curbs.

"The fact that some 300 million allowances are made available for financing breakthrough technologies in industry highlights that the Parliament tried to balance an ambitious ETS and industry concerns related to a higher carbon price," said Marcus Ferdinand, head of Point Carbon's EU ETS analysis.

Hinkley Point C faces further delays

- Investment decision likely to be delayed by months
- UK may retaliate over Austria's threatened legal action

Junior Isles

EDF Energy looks certain to miss its March target for making a final investment decision on the proposed Hinkley Point C nuclear power plant. Last month it unveiled a long list of outstanding issues and warned that talks to resolve them could take months.

In a statement, the French state-owned utility said: "EDF and the UK government are working hard to finalise all agreements on Hinkley Point C and are making significant progress in all areas with the shared objective of finalising documents in the coming weeks.

"This will allow a final investment decision to be possible in the next few months. EDF is also making progress in discussions with future investment partners in the project."

The proposed 3.2 GW Hinkley Point C station, potentially the first nuclear plant in the UK in a generation, will cost an estimated £24.5 billion and EDF therefore requires government support as well as capital from other investors.

EDF is still in negotiations with the government to finalise a subsidy deal and other financial arrangements related to the project including an infrastructure loan guarantee from the UK Treasury.

It also remains locked in talks with China General Nuclear Corporation (CGNC) and China National Nuclear Corporation (CNNC), which are expected to take a 30-40 per cent stake in the plant. The two Chinese companies are reported to be making demands that are complicating negotiations.

The Times reported in February that CGNC and CNNC are demanding that the French government protects them if the project goes bust. They are said to have serious concerns over Hinkley Point's European Pressurised water Reactor (EPR) design and also the financial health of Areva, the French company supplying the reactors.

Hinkley C received a further blow in February when Austria said it was looking to take legal action against the project – a move that could delay the project by up to five years.

UK ministers have reportedly warned their Austrian counterparts that retaliatory measures will be launched if Vienna goes ahead with plans to challenge a EU state aid decision approving subsidies for the project.

A diplomatic cable from the Austrian embassy in London to Vienna, seen by *the Guardian* newspaper and Greenpeace, says that the Foreign Office's Europe director, Vijay Rangarajan, conveyed a message that "the UK will take in the future every opportunity to sue or damage Austria in areas that have strong internal political effects," unless the lawsuit was dropped.

"Further steps and escalation cannot be excluded after the complaint has been submitted," the cable said.

Government sources in Vienna said that they did not expect Britain's latest move to change their plans to appeal the EU state aid decision imminently.

Wind power back on track

After a slowdown in 2013, the wind industry set a new record for annual installations in 2014. Globally, 51 477 MW of new wind generating capacity was added in 2014 according to the latest global wind market statistics released by the Global Wind Energy Council (GWEC).

The record-setting figure represents a 44 per cent increase in the annual market, and is a solid sign of the recovery of the industry after a rough patch in the past few years. Total cumulative installations stand at 369 553 MW at the end of 2014.

China continues to drive global growth, setting a new record in 2014 with 23 351 MW of new wind power, representing 45 per cent of the global market, and dominating the world-leading Asian market's total installations of 26 161 MW.

The European market grew marginally in 2014, with 12 820 MW of new capacity, and just shy of the 2012 record. Germany's 5279 MW of new capacity smashed the old record and cemented its position as European market leader, with the UK a distant second at 1736 MW.

Meanwhile the World Wind Energy Association released its preliminary figures ahead of official publication in April. It said that the US market recovered from its previous slump and reached 4.9 GW. It highlighted Brazil as a newcomer to the top 12 countries in 2014, noting that it added capacity of 2.8 GW, the first time that a Latin American country has reached such a figure.

According to the WWEA, it was the first time since 2009 that the speed of growth in the global wind industry was bigger than in the previous year. Global installed wind capacity grew by 16 per cent compared with the year 2013, significantly higher than the previous 12.8 per cent.

Stefan Gsänger, WWEA Secretary General, said: "The global figures for 2014 look very bright… However, there are some clouds in the sky; several of the leading wind markets especially in Europe have seen stagnation, and some of the booming markets have been caused by anticipated setbacks in policy frameworks."

See page 12 for GWEC's latest global wind power statistics

EPA's Clean Power Plan no threat to reliability

- NERC did not address mitigating factors
- Obama request $842.1 million for fossil energy

Junior Isles

Concerns that the US Environmental Protection Agency's (EPA) Clean Power Plan (CPP) is a threat to the US electric system security are largely overstated, according to two recent independent reports.

The North American Electric Reliability Corporation (NERC) had raised concerns about the potential impact of the CPP, which is intended to reduce the US electric system's CO_2 emissions by 30 per cent from 2005 levels by 2030.

However, a report by The Brattle Group says that implementation would involve more alternatives for compliance than NERC has recognised and, as a result, will not materially affect system reliability.

"We find that the concerns raised by NERC about potential reliability issues arising from compliance with proposed carbon emissions standards are largely overstated," said Jurgen Weiss, PhD, senior researcher and lead author of The Brattle Group report.

"In its initial reliability review, NERC raised several concerns about the feasibility of achieving emissions standards with the technologies used to set the standards, but NERC did not address several mitigating factors. These include the impact of retiring older, inefficient coal plants, due to current environmental regulations and market trends on emissions rates of the remaining fleet; various ways to address natural gas pipeline constraints; and evidence that higher levels of variable renewable energy sources can be effectively managed.

"With the tools currently available for managing an electric power system that is already in flux, we think it unlikely that compliance with EPA carbon rules will have a significant impact on reliability."

There were similar findings in another report released two weeks later by the Analysis Group. Its report notes that the energy industry's past experience and ongoing efforts should address many of the concerns raised in the nearly four million comments that have been received by the EPA.

It stated: "Many of the reliability issues identified in public comments are not new – the industry has responded successfully and effectively to similar challenges in the past." It adds that for several years, some of the trends that observers say must now be addressed in response to the CPP are "actually developments that have been underway for many years – and that are currently being addressed".

In evaluating potential concerns related to the plan, the Analysis Group notes that "a recent survey of more than 400 utility executives nationwide found that more than 60 per cent felt optimistic about the Clean Power Plan and felt that EPA should either hold to its current emissions reduction targets or make them more aggressive".

The reports' findings come as President Obama requested $842.1 million for fossil energy programmes in the fiscal 2016 budget unveiled last month.

Notably, the President's budget requests $560 million for the fossil energy research and development (FER&D) portfolio. In FY 2016, FER&D will continue to focus on carbon capture and storage (CCS) and activities that increase the performance, efficiency, and availability of systems integrated with CCS. The news came even as the government announced it was withdrawing $1 billion in funding for the FutureGen 2.0 CCS project in Illinois.

The FY2016 budget proposes $7.4 billion to fund clean energy technologies and a $4 billion fund to encourage US states to make faster and deeper cuts to emissions from power plants.

It also calls for the permanent extension of the Production Tax Credit, used by the wind industry, and the Investment Tax Credit, used by the solar industry.

Mexico energy reform attracts clean energy companies

Recent reforms in Mexican energy laws, including a mandate for 35 per cent of generation to come from clean resources by 2024, are creating significant opportunities for development of Mexico's substantial wind and solar resources.

In one of the first major moves since the energy reforms, Pattern Energy Group LP (Pattern Development) announced it has signed a joint venture (JV) agreement with CEMEX Energia to set up renewable projects in the country.

The CEMEX Energia/Pattern Development JV envisions advancing development opportunities and acquiring projects from third parties in the early to mid-stages of their development process. The joint venture expects to build a portfolio of at least 1000 MW of renewable energy projects over the next five years.

Pattern Development's affiliate, Pattern Energy Group Inc. (Pattern Energy), has the right of first offer (ROFO) to acquire the projects it develops. Pattern Energy maintains a list of identified ROFO projects, which represent near-term acquisition opportunities. The ROFO list represents a portion of Pattern Development's 4500 MW pipeline of development projects, all of which are subject to Pattern Energy's right of first offer.

Mike Garland, President and CEO of Pattern Development said: "We enter the rapidly growing renewable energy market in Mexico with a strong and experienced local partner in CEMEX, a global leader in building materials with a successful track record of developing projects in Mexico."

Fernando A. Gonzalez, CEO of CEMEX commented: "We are very enthusiastic about Mexico's energy sector future, and we will leverage our experience in developing projects that benefit the country."

The development of new wind and solar generation can help meet Mexico's growing demand for electricity, reduce CO_2 and other emissions, and help reduce high power costs.

Mexico says it will add 66 GW to its power grid over 15 years, with investments of $90 billion expected in renewables.

In late January César Hernández, Undersecretary of Sener (Secretaría de Energía de México), said that that private companies and state utility CFE will have the opportunity to provide more electricity to the country.

Hernández said: "We envision a process in which the modernisation of the industry reduces the cost of services transmitted to all users. This process has already begun with fuel oil-generated electricity being replaced by natural gas, while generation using renewables is also much cheaper."

Mexico has resources to exceed its goal of 30 per cent of power generation from non-fossil fuels by 2024; 40 per cent by 2035, and 50 per cent by 2050.

Boost for Argentina's nuclear plans

Argentina's ambitions to raise its nuclear generating capacity received a boost last month as Chinese and Argentine leaders signed a batch of agreements, including collaboration on two new nuclear power plants.

During a state visit to China, Argentine President Cristina Fernandez de Kirchner said two nuclear plants would be built in Argentina with transfer of technology from China.

In addition to the nuclear deal, a total of 14 agreements have been signed by the two nations for cooperation in energy, financing, space technology, media, and information technology.

The agreement follows news that Argentina's nuclear power authority gave permission for the 745 MW Atucha II nuclear plant, which launched operations in June, to ramp up to full capacity.

Since the plant's startup, Atucha II has incrementally increased output while undergoing tests to verify the proper functioning of its systems.

Wind helps mitigate Brazil power rationing risk

Low rainfall in two consecutive rainy seasons has prompted the Brazilian government's electric sector monitoring committee (CMSE) to raise the risk of electricity supply deficits in the southeast/centre-west subsystem to 6.1 per cent from 4.9 per cent. However, it is believed that the situation is not as severe as in 2001 partly due to increased generating capacity, a significant proportion of which is in the form of wind power.

The CMSE continued to play down the possibility of power rationing, highlighting the fact that an additional 504 MW had already been added to the grid this year, including an additional 186 MW of thermoelectric capacity at the Baixada Fluminense plant in Rio de Janeiro state. The government expects a total of 6410 MW of new generation capacity this year.

Local electric energy think tank PSR, however, says the risk of power rationing is greater than 50 per cent.

According to ratings agency Fitch, reservoir levels at the southeast/midwestern subsystem, the most representative in Brazil, were at 16.82 per cent on January 29, 2015, down significantly from 40.28 per cent on January 31, 2014 and 31.41 per cent at the end of January 2001 – the time of the last power rationing.

Fitch says the higher installed capacity of thermal plants in Brazil and a more robust transmission grid to manage and transfer energy throughout the country, when compared with the hydrology crisis in 2001, however, partially mitigate the rationing risk. It said the more recent development of wind farm projects is also notable.

According to the World Wind Energy Association, Brazil added 2.8 GW of wind power in 2014 and more new capacity is in the pipeline.

In February Gamesa signed a 150 MW order to install 54 of its G114-2.0 MW turbines for Serveng and another 21 G97-2.0 MW turbines for Chesf and Sequoia.

At the end of January EDP Renovaveis, S.A. announced it had executed project finance structure agreements with the Brazilian Development Bank for the Baixa do Feijao project, which is currently under construction. The project comprises four wind farms with a total capacity of 120 MW.

Also at the end of January Brazil's electricity sector regulator Aneel gave two local firms the go-ahead to build and operate wind farms with a combined capacity of 48.6 MW as independent power producers (IPPs).

Australia favours solar over wind

Government plans to reduce renewable energy support are a big threat to wind but large-scale solar projects still look promising.

Syed Ali

Australia's solar power sector appears to remain robust even though the outlook for wind looks uncertain, as the government looks to slash renewable energy support.

Signalling the strength of solar, Australia last month approved its biggest solar farm. Developers are hoping to start construction of the AS$1 billion ($785 million) project in 2016.

The solar farm is planned to be built in Queensland, west of Brisbane, at a 200-hectare site at Bulli Creek. The project developer, Solar Choice, said that by the time the application is complete in 8-10 years it will have a capacity of 2 GW.

The uncertainty surrounding Australia's clean energy policy still presents a significant hurdle, but Solar Choice says the Bulli Creek project is attracting attention from a range of global investors prepared to take a medium- and long-term view.

Managing Director of Solar Choice, Angus Gemmell told RenewEconomy in an interview: "We believe that large-scale solar is on the right side of history – it's not a matter of if these projects will be built, but when."

It is unclear how the solar industry will be affected if the government does not re-commit to a new Renewable Energy Target (RET).

Its attempts to cut or abolish the target has brought investment in large-scale wind and emerging solar projects to a complete halt, apart from companies such as Solar Choice that are prepared to go up-stream and take on development risk towards "pipeline ready" status.

Many, including Bloomberg New Energy Finance suggest, however, that large-scale solar projects will account for up to half of the approximately 8 GW of new projects required to meet Australia's current 41 000 GWh target.

Much of the Coalition's problems with the RET appear to be due to its dislike of wind power generation. This is because solar costs are falling faster than wind energy costs, and their daytime production means that in theory their output is more valuable for peak pricing on the National Electricity Market.

Wind farms are Australia's second most used renewable energy source, behind hydropower but ahead of solar, providing a quarter of the country's clean energy and four per cent of its total energy demand.

But while households can collect rebates for installing their own rooftop solar panels, wind farms rely on certificates, or tradeable securities handed out by the government, to offset costs.

This support hit a roadblock a year ago when new Conservative Prime Minister Tony Abbott ordered a review of the country's target for clean energy use by 2020, which ultimately recommended slashing it by a third, in line with falling overall energy demand. A lower target would mean a lower certificate price.

According to recent reports Australia faces a A$17 billion ($13.3 billion) exodus of investment from its wind power industry as a result.

Some 44 Australian wind farm projects, about half overseas-funded, have been shelved since the government said it wanted to cut state support for the industry, with investors and operators saying they are considering either downsizing or leaving the country altogether if it succeeds.

The Australian arm of Spanish infrastructure group Acciona, the world's largest renewable energy developer, has frozen about A$750 million of wind power projects because of the stalemate, said local managing director Andrew Thomson.

"When you're a subsidiary (of a global business), you're competing for capital, you're competing for your budget allocation next year," he said.

"If the parent company can't see that there's a stable environment it becomes really difficult to get traction. For us at the moment it's a really difficult sell."

Japan begins review on cost of generation

Japan has started reviewing the costs of various sources of power generation including nuclear power to facilitate the debate on its energy mix for 2030.

The review will include the cost of nuclear power, including how to assess expenses of radiation clean up and decommissioning work in the wake of the 2011 nuclear accident at the Fukushima Daiichi power plant. It comes amid strong criticism that the technology's economics have been distorted by not reflecting all necessary costs.

In 2011, the government of the Democratic Party of Japan, now in opposition, estimated that nuclear power generation costs 8.9 yen/kWh (7.5¢/kWh), coal-fired thermal power 9.5 yen/kWh, wind power up to 23.1 yen/kWh and large-scale solar power up to 45.8 yen/kWh.

The Ministry of Economy, Trade and Industry, which oversees the power sector, has maintained its stance that nuclear power is no more expensive than other power sources, but the cost could be reviewed through an expert panel's discussions.

The government aims to reach a conclusion on the energy mix before a summit of the Group of Seven (G7) industrialised nations slated for June in Germany, where Japan hopes to show its stance on addressing carbon emission reductions.

Japan has been struggling to keep a lid on its emissions since it closed its nuclear plants following the Fukushima accident. While the government has faced calls to reduce its reliance on nuclear, it maintains that nuclear must remain an important part of its energy mix. A ratio of between 15 to 20 per cent for nuclear power was floated as a starting point by some members of a panel set up under the country's industry ministry, compared to about 29 per cent in the year before the Fukushima disaster.

■ Tokyo Electric Power Co. and Chubu Electric Power Co. will transfer operations of their existing thermal power plants to a new joint venture, creating a huge thermal power company with a dominating market share. Under an agreement finalised last month, their thermal power generation operations will be transferred in several years to the 50-50 joint venture to be established in April. The tie-up is the pillar of Tepco's rehabilitation plan approved by the government in January last year following the 2011 Fukushima Daiichi nuclear power plant disaster.

Indonesian firms eye IPP business

A number of publicly listed firms are looking to venture into power generation to cash in on more stable income as the government's plan to boost the country's electricity capacity has opened doors for expansion.

The companies are looking to enter the sector as independent power producers (IPPs) to tap opportunities offered by the new government's 35 000 MW electricity procurement plan in the next five years, of which more than 20 000 MW is expected from IPPs.

One such publicly listed energy company is Indika Energy. At the end of January it announced that it is looking to develop a 1000 MW power plant project with at least $1.2 billion in investment.

Reza Nugraha, an analyst from MNC Securities, said that participating in the power sector is a smart move, if not a must.

"As we can see, most of the companies making an entry into the power supply business are either coming from the construction sector or from the coal mining sector. For construction firms, it is a move to diversify their business, and it's only normal for them to seek out business that is currently booming," he said.

Combined with around 7000 MW projects in the pipeline, the government's total target reaches more than 42 000 MW. Of that target, state electricity firm PLN will develop around 18 000 MW.

Last month PLN said it is looking to secure direct loans from international financial agencies to support investment needed for a number of projects.

Under the direct lending mechanism, financial agencies will be able to directly channel the loans to PLN. In previous practices via the so-called sub-loan agreement (SLA), the agency disbursed the fund to the state, which then channelled the money to the designated state-owned firms.

"The agencies offer direct lending to PLN and the government will only need to give its guarantee. A presidential decree relating to the matter is being drafted," PLN director Murtaqi Syamsuddin said.

According to Murtaqi, lending agencies such as the World Bank and the Asian Development Bank are willing to issue loans for the development of non-coal fired power plants, transmission networks and other programmes aiming to accelerate the improvement in electrification ratio.

The national electrification ratio stood at 84 per cent as of the end of last year. However, there are some areas, such as Papua, where the ratio was as low as 43 per cent. The government is aiming to see a 99 per cent electrification ratio by 2022.

Pertamina, an Indonesian state-owned company engaged in oil, gas, new and renewable energy and Akuo Energy, a French renewable energy power producer, recently signed a Memorandum of Understanding (MOU) for the development of new and renewable energy for electricity throughout Indonesia.

Commenting on the deal, Director of New and Renewable Energy Pertamina, Yenni Andayani, said: "As we all know, government has more interest on remote islands which is highly dependent on diesel fuel for generating electricity to fulfill energy demand on this islands. At this phase, we focus on that region," said Mrs Yenni.

Shale gas progress falters in Europe

The UK and Germany are progressing towards the creation of shale gas industries, but across Europe opposition to fracking remains strong and uncertainty remains about the viability of the region's resources.

Siân Crampsie

The prospects for the widespread development of a shale gas industry in Europe have faltered in spite of attempts by industry and some governments to kick-start exploration.

In the UK, the Welsh and Scottish governments have voted in favour of imposing moratoria on fracking, defying the British government's wish to develop the domestic shale gas industry.

Meanwhile in Romania, Chevron Corp said it would give up shale gas exploration plans because its assessment of the country's resources indicated that it would not compete favourably with other investment opportunities.

In January, Chevron said it would discontinue its shale gas operations in Poland.

In the UK, the Conservative government has been keen to put the country at the forefront of shale gas development in Europe in order to boost economic growth and secure domestic gas supplies.

Central to this plan was new legislation enshrined in the Infrastructure Bill, which last month received Royal Assent.

The Infrastructure Bill is designed to simplify procedures for the onshore oil, gas and deep geothermal industries to access reserves 300 m or more underground. It was passed with some major amendments tabled by the Labour opposition.

The amendments included clauses stating that fracking cannot take place in land located within the boundary of a groundwater source protection zone or within or under protected areas such as National Parks.

"That the government has backtracked to weaken fracking regulations, including those that should protect our vital drinking water supplies, simply proves that we need a moratorium on fracking," said Greenpeace energy campaigner Simon Clydesdale. "Despite Labour's efforts to strengthen them, the regulations passed today are so full of loopholes that they cannot be trusted to protect our water, countryside or climate."

In January the Scottish government announced a moratorium on fracking pending a full public consultation and more research into the impact on public health. Just days later the Welsh parliament voted against the use of fracking in Wales.

Environmentalists opposed to shale gas exploration because of concerns about the impact of fracking on groundwater, welcomed the move by Scotland and Wales.

Scotland's decision was also welcomed by UKOOG, the UK's representative body for the onshore oil and gas industry. Ken Cronin, Chief Executive of UKOOG said: "We recognise that the general public have concerns about the issues around fracking and welcome this opportunity to present the facts to the Scottish people. Scotland has led the way in the development of offshore oil and gas and should take this opportunity to do so again onshore.

"Four fifths of Scotland's heat and many everyday items come from natural gas. However, Scotland in 2020 could be importing three quarters of its gas potentially from other less stable countries.

"Onshore gas and oil will benefit the Scottish economy, not only directly, with jobs created through oil and gas extraction, but also indirectly, as oil and gas is a critical raw material for the chemicals industry at facilities such as Grangemouth.

"The onshore oil and gas industry has also committed to a multi-million pound programme of benefits for local communities and stakeholders as well as boosting contributions to local councils."

In Germany the federal government has held a public hearing on a planned draft law covering hydraulic fracturing. Evidence was given to the Federal Environment and Economy Ministry at the Berlin hearing. The government is expected to finalise a draft outline in the coming weeks that will be debated by Bundestag members.

Norway makes climate pledge

Norway has pledged to cut its emissions of carbon dioxide in line with EU plans ahead of the UN climate talks in Paris in December.

The Norwegian government says that it has set a target of cutting greenhouse gas emissions by at least 40 per cent over 1990 levels by 2030, and that it wants to join the EU framework for climate policies.

Separately, it has been revealed that the country's sovereign wealth fund has removed 32 coal mining companies from its portfolio in the last year in a bid to improve its social and environmental investment credentials.

The Norwegian Government Pension Fund Global (GPFG), the world's richest sovereign wealth fund, said in a report released last month that it had divested from a further 82 companies involved in tar sands, cement making and gold mining. It said that these firms faced risks from regulatory action on climate change, and that their business models are incompatible with governmental pledges to tackle climate change.

Under the second commitment period of the Kyoto Protocol, Norway is committed to reducing global emissions of greenhouse gases equivalent to 30 per cent of Norwegian emissions by 2020 compared to 1990. Norway will now submit to the UN its 2030 climate targets.

"Norway will reduce emissions by at least 40 per cent by 2030. This will increase the level of ambition in Norwegian climate policies," said Norwegian Prime Minister Erna Solberg. "There is a need to transform the Norwegian society. An important reason is the need to reduce global greenhouse gas emissions in order to avoid dangerous, anthropogenic climate change.

Norway also said that it would continue to use the EU's emissions trading scheme but would not use UN offsets to help meet its climate targets. Its proposals are expected to be approved by parliament.

Solar firms set for change

- Rooftops new focus for major players
- CFD auctions under way

The UK's big solar energy players are altering their strategies ahead of planned changes to the country's subsidy scheme for renewable energy.

Conergy and Lightsource Renewable Energy have announced ambitious plans to expand into the commercial rooftop sector, development of which has lagged behind that of large-scale ground-mounted schemes and domestic rooftop schemes.

At the end of March 2015, ground-mounted solar photovoltaic (PV) schemes over 5 MW in size will no longer be eligible to receive renewables obligation (RO) certificates, the UK's current support mechanism for large-scale renewable energy schemes.

Instead, such solar farms will have to apply for funding under the new contracts for difference (CFD) scheme, which is based on a competitive annual auction.

Lightsource says it will invest more than £125 million in the UK rooftop solar market in 2015 in a bid to deliver 120 MW of solar capacity on commercial buildings, schools, households and social housing. Key to its plan is the creation of partnerships with PV installers already active in the rooftop sector, it says.

Conergy UK announced last month that it will split its business in two, one focused on solar farms and the other on rooftop installations. It has secured "some of the biggest names in real estate and energy management" to help cement its place in the rooftop sector, it said in a statement.

"Conergy will start bringing new capital to the market, which we will invest strategically, in new and scalable business models," said Conergy MD for UK & Ireland, Robert Goss.

Rooftop solar installations remain eligible for the UK's feed-in tariff (FIT) subsidy scheme, although the annual budget for commercial-scale rooftop PV schemes is too small, according to industry experts.

Meanwhile, the first round of CFD contract bidding got under way in late January and winning bids were expected to be announced in late February as *TEI Times* went to press.

Offshore wind sector stable, says EWEA

There was a slight decline in the number of offshore wind installations in 2014, indicating stability in the sector following a record 2013, according to the European Wind Energy Association (EWEA).

In 2014, 408 new offshore turbines were fully grid connected, adding 1483 MW to the European system. The total installed capacity for Europe now stands at 8045 MW in 74 offshore wind farms in 11 European countries.

Justin Wilkes, Deputy Chief Executive Officer of EWEA, said: "It is not surprising that we see a levelling-off of installations in 2014 following a record year in 2013."

In 2014, the UK accounted for over half of all new installations (54.8 per cent) with Germany in second (35.7 per cent) and Belgium (9.5 per cent) making up the rest. But for 2015, Germany is expected to install more offshore capacity than the UK, which has dominated installations in Europe for the past three years.

The largest wind farms to be fully completed will be RWE's Gwynt y Mor (576 MW) in North Wales followed by Global Tech 1 (400 MW) in the German North Sea.

Last month the UK government gave consent for the Dogger Bank Creyke Beck offshore wind farm, a proposed 2400 MW development covering 430 square miles in the North Sea.

If built, the wind farm will push the envelope of offshore wind technology because of its distance from the shore and water depths.

"This is an awesome project," said Nick Medic, RenewableUK's Director of Offshore Renewables. "It will surely be considered as one of the most significant infrastructure projects ever undertaken by the wind industry. A colossal wind energy power station right in the middle of the North Sea, comprising hundreds of offshore wind turbines over 80 miles off shore."

Algeria updates renewable energy programme

Algeria is to outline a plan to more than double its renewable energy target.

Minister of Energy Youcef Yousfi has said that it will set a new target of 25 000 MW of installed capacity instead of the existing target of 12 000 MW that was set in 2011.

Speaking to the People's National Assembly (APN)'s Committee on Economic Affairs, Yousfi said that the ministry would present an update of the renewable energy programme with new ambitious targets for 2030 with more than one-third of the country's energy needs being met by renewable energy.

Algeria supports renewable energy development with a feed-in tariff

Youcef Yousfi is setting ambitious targets:

(FIT) programme that was launched in April 2014. It offers a guaranteed rate for the first five years of a project's life, then a performance-based rate for the next 15 years.

Algeria has around 350 MW of solar photovoltaic (PV) projects under development.

Actis targets Africa with new renewables platform

■ JV with Mainstream Renewable Power ■ Up to 900 MW targeted in three years

Siân Crampsie

Private equity group Actis is to establish a $1.9 billion renewable energy business targeting opportunities in Africa.

The firm has announced plans to create a joint venture firm known as Lekela Power with Mainstream Renewable Power, a global wind and solar power project developer.

Actis is hoping to replicate the success it has had with its other regional renewable energy platforms, including Globeleq Mesoamerica in Central America, Aela Energía in Chile, Atlantic Energias Renováveis in Brazil and Mexico's Zuma Energía.

Last month it launched Ostro Energy, a renewable energy platform for the Indian market.

Mainstream Renewable Power will own 40 per cent of Lekela, which will aim to develop 700-900 MW of capacity over the next three years. Actis will contribute $220 million of equity to the company for its 60 per cent stake.

Actis already has an existing African power company, Globeleq Africa, with operations in five countries including Cameroon and Tanzania. In 2012, it also listed Ugandan power company Umeme in Uganda and Kenya, after buying the state utility in 2005.

However, Actis said there was a need for further financing in the continent. "With soaring demand and funding constraints, Africa's need for renewable energy is pressing," said Lucy Heintz, Partner and Head of Renewable Energy at Actis. "In South Africa for example, currently 95 per cent of the country's electricity is generated by coal-fired power stations. While the region has significant natural and fossil fuel resources a lack of long-term investment has led to a reliance on emergency and short-term diesel generation.

"An improvement in the regulatory regime in many African countries has opened up the sector for further investment. Drawing on our deep understanding of the renewable energy sector, we are looking forward to unlocking the country's formidable renewable resources and meeting some of the urgent demand."

Three wind projects in South Africa, which were announced in mid-February, will form the bedrock for the Lekela platform. These are located in the Northern Cape and have a combined generation capacity of 360 MW and are expected to achieve commercial operation in early 2016.

Lekela also has a pan-African pipeline of projects, including the 225 MW Ayitepa wind project in Ghana, wind and solar projects in South Africa and 100 MW of wind and solar power in Egypt, where the company has recently been awarded projects in the country's new feed-in tariff programme.

Mainstream and Actis have previously collaborated on projects in South Africa and Chile. Lekla will operate in a similar way, with Mainstream taking responsibility for the full end-to-end management of the projects, including site identification, project development, construction management as well as the operation and maintenance of plants.

WWF warns on 2020 targets

Environmental group WWF says that governments should do more to ensure that greenhouse gas emissions peak within the current decade in order to keep average global warming temperatures to below 2°C.

WWF believes that much attention is currently being paid to the post-2020 period in the run-up to the global climate talks in Paris in December, but says that there is a danger that nations will lose sight of the need to curb emissions over the next five years.

In a new report, it says that there is a 'gigatonne gap' in emissions up to 2020 that should be tackled, and that with current emission trends the world is heading for a 3.6-4°C scenario.

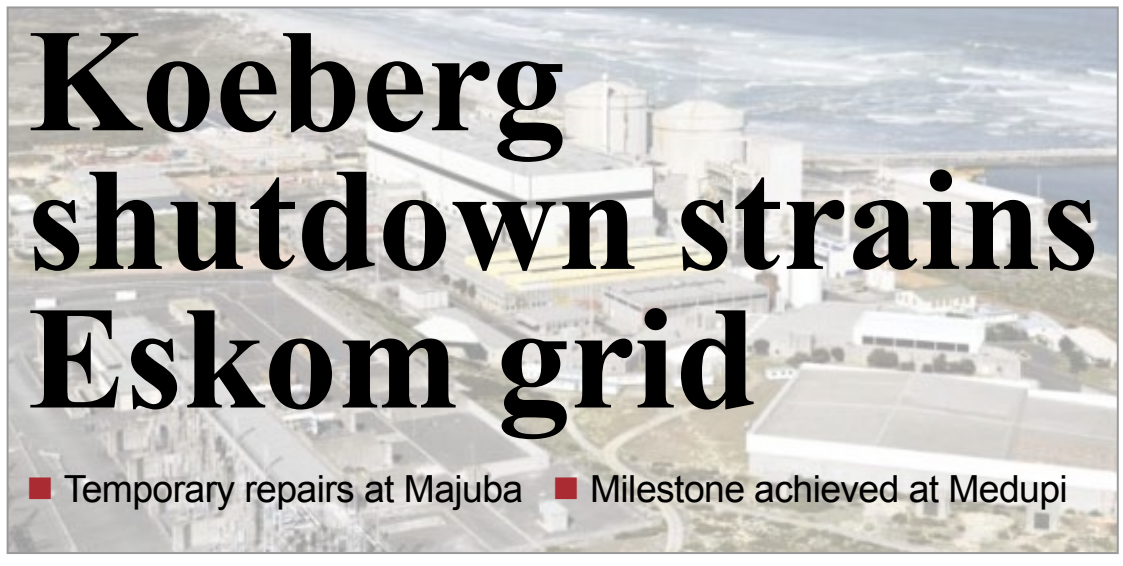
The report outlines immediate mitigation measures that can be taken by ten countries. "These range from scrapping coal-fired power stations and increasing renewables to improving energy efficiency, strengthening emissions targets and addressing deforestation," said Tasneem Essop, WWF's head of delegation to the UN climate negotiations.

It suggests that China should move away from coal by setting a coal cap lower than the current cap of 4.2 billion tonnes and bringing it forward from 2020. "We'd really like to see China speed up the phasing out of old and inefficient coal-fired power plants, right away, and also cancel plans for new ones – which would likely end up becoming 'stranded assets' and bad investments in any case," writes Lunyan Yu and Liangchun Deng of WWF China.

In Mexico, WWF says that the government should enforce an energy transition policy that sets a decarbonisation course for 2050, and set ambitious targets for 2025 and 2030. It says that Brazil needs to start making different investment and promoting low carbon development at the national level, as well as make commitments at the international level.

Other countries and regions included in the report include India, South Africa, Japan, France, the USA, Australia and the EU. WWF wants the EU to establish a tougher emissions target for 2020, improve the emissions trading scheme, and make more effort and commitment around energy efficiency.

"Those countries that have the responsibility and capacity to do more should lead this transition as well as support others that can do much more if there is financial, technology and capacity building collaboration and support," said Essop. "We need to see commitments at national level, as well as multi-lateral commitments – and crucially they need to be turned into concrete actions."



Koeberg shutdown strains Eskom grid

■ Temporary repairs at Majuba ■ Milestone achieved at Medupi

A technical fault at South Africa's only nuclear power plant has reduced available generating capacity in the country by 930 MW and put the grid under further strain.

Koeberg Unit 1 tripped in early February and its owner, South African national utility Eskom, said it would keep the unit on shutdown to enable completion of a detailed investigation to determine the root cause of the trip.

The shutdown forced Eskom to implement its load shedding programme on several occasions throughout February as demand for electricity outstripped supply. It follows a warning issued by Eskom in January that any abnormal event would push the South African system into load shedding.

Koeberg Unit 1 was due to enter a refuelling and maintenance outage in mid-February and will return to service at the end of May, Eskom said in a statement. The firm has pledged to ramp up its maintenance schedule on all of its power plants in spite of the low reserve margin because maintenance issues are now affecting the reliability of the power system.

Later in February Eskom announced that emergency repairs had been carried out at the Majuba power station, adding 1800 MW to the grid.

Late last year a silo collapsed at Majuba, impacting coal supplies to all six units at the station. Eskom says it is now using mobile feeders to deliver coal to the plant's boilers.

On 18 February Eskom announced that it had reached a critical milestone in the commissioning of the Medupi coal-fired power plant with the synchronisation of unit 6. Commercial operation of this first 794 MW unit is expected in mid-2015.

In 2016 the first unit of the 4 x 333 MW Ingula pumped storage hydropower plant is due to start operating, and in 2017 the first of six 800 MW units at the Kusile power plant is due on-line.

Eskom has been battling low reserve margins caused by rising energy demand and a funding deficit for its capital expenditure programme.

In September the South African government agreed a support package for Eskom to help it raise more debt and continue its investment programme.

Initiative drives change in oil and gas sector

Immelt says the programme would have a "profound impact" on environmental performance

A new collaboration will target flaring, emissions and water usage at oil and gas well operations.

Siân Crampsie

GE and Statoil say that a new joint initiative will help to drive change in the environmental performance of the global oil and gas sector.

The two companies have announced a collaboration designed to accelerate the development of environmentally friendly and economically sustainable energy solutions. The initiative will be technology-driven and could kick-start an industrial response to some of the biggest challenges facing global oil and gas production, including flaring, CO_2 and methane emissions and water usage.

Jeff Immelt, Chairman and CEO of GE said that the programme would have a "profound impact" on the environmental performance of the oil and gas industry. It will initially focus on a number of projects that have already been initiated, including flaring reduction and reduced water usage.

"Through this collaboration, we hope to be a model for the rest of our industry, and to inspire thinking, creativity and innovation in addressing the challenges of more sustainable energy," said Immelt.

As part of their collaboration, the two firms also launched a global 'innovation challenge', inviting innovators from around the world to submit ideas and solutions for making energy production more sustainable.

Eldar Saetre, President and CEO of Statoil, said that collaboration would be the key to reducing emissions in the oil and gas sector. "The private sector has a responsibility to leverage its skills and expertise to contribute to the development of new solutions," said Saetre. "Collaboration is a key component to achieving important positive change."

One area of focus will be to reduce flaring by capturing, compressing and using natural gas at well sites for operations such as fuelling rigs, vehicles and other equipment. According to the World Bank, over 150 billion m^3 of natural gas per years is flared or vented from well operations, equivalent to 30 per cent of the EU's natural gas consumption.

Gas flaring adds around 400 million tons of CO_2 to global emissions of CO_2.

Other projects earmarked by GE and Statoil include increasing fuel efficiency through gas compressor optimisation and online turbine water wash technology, and using liquefied CO_2 to reduce water usage in fracturing operations.

In later phases, the collaboration will pursue work in other areas, including rapid scale-up of the technologies needed to improve operational performance. It is also targeting a reduction in NO_x and methane emissions and will help to increase oil and gas production.

In its first innovation challenge, the GE-Statoil initiative will ask for solutions specifically addressing the use of sand in unconventional oil and gas operations. Reducing the use of sand has the potential to reduce the environmental impacts on local communities, lessen emissions and make energy production more efficient. GE Oil & Gas and Statoil will help fund the commercial development of winning approaches.

E.On targets further Italian asset sales

E.On is selling off renewable energy capacity in Italy in a bid to meet its financial targets.

The German energy giant last month sealed a deal to sell its solar business in Italy to a private infrastructure fund and said that it is also looking for a buyer for the 531 MW Terni hydropower plant.

The move follows a January deal with Czech firm Energetický a Průmyslový Holding (EPH) to sell E.On's thermal generating assets in Italy.

Milan-based F2i SGR, which has been active in Italy's photovoltaic (PV) sector since 2009, has purchased E.On's Italian solar business for an undisclosed price. The assets sold include seven ground-mounted solar plants with a capacity of 49 MW.

E.On says the solar plants are located in areas with high irradiation and benefit from favourable solar regimes providing stable cash flows in the long-term. About 70 per cent of the capacity is installed on Sardinia.

E.On's Terni hydropower plant is the firm's most valuable Italian asset, valued at $1.13 billion. *Reuters* reported last month that renewable energy group Erg is seen as the front-runner to buy the plant.

Other Italian assets owned by E.On and up for sale include wind energy plants and its power sales business.

The asset sales are in line with E.On's bid to reduce debt and restructure its business to enable it to focus on renewables, power distribution and customer solutions.

It announced the new strategy in late 2014 in response to major changes in global energy markets, particularly the growth in renewable energy and technology innovation.

Siemens under pressure

Siemens is to shed two per cent of its workforce in an effort to get its business back on track.

CEO Joe Kaeser said that the firm's power and healthcare business units would bear the brunt of the 7800 job cuts that will help Siemens cut $1.1 billion in costs.

The move came after Siemens' January results announcement, in which it said net profits fell 25 per cent in the recent quarter largely due to lower earnings in its power and gas operations.

The results have put pressure on Kaeser, Siemens' former finance chief who took over from Peter Loescher 18 months ago. His most recent acquisition – a $7.6 billion plan to purchase US oilfield equipment maker Dresser Rand – is in particular under scrutiny because of falling oil prices.

Net income fell to €1.1 billion ($2.18 billion) in the October-December quarter, the company's fiscal first. That was down from €1.46 billion a year earlier. The earnings figure fell short of the €1.22 billion expected by analysts.

Revenues were up five per cent to €17.42 billion, boosted by favourable currency exchange rates. However there was a 39 per cent drop in profits in its gas turbines business sector. Revenues in the wind power and renewables division grew 12 per cent compared to the first quarter of last year, but it reported a 42 per cent drop in orders year-on-year. Siemens blamed "sharply lower volume from large orders, particularly in Germany and the US" for the drop.

Vattenfall restructures

- Strategy review continues
- Aegir wave power exit

Vattenfall is to implement a new organisational structure and executive management team as part of wider plans to review its strategy and address current market challenges.

The Swedish utility last month said that in 2014 it had continued to consolidate its operations and shift production towards renewables. Its end-of-year results were weighed down by impairment losses but shored up by efficiency improvements, it said.

"2014 was an eventful and challenging year that was characterised by weak demand, a surplus of production capacity and falling electricity prices. Demand was further dampened by warm weather," said Magnus Hall, President and CEO of Vattenfall.

Net sales for the year ending 2014 were SEK 165 945 million ($19.94 billion), down from SEK172 253 million in the previous year. Profits after tax stood at SEK-8284 million, an improvement on the 2013 result of SEK-13 543 million.

Vattenfall's new structure will take effect from April 1, 2015, replacing the firm's current regional structure. It will be organised into six new business areas: heat, wind, customers & solutions, distribution, generation and markets.

As the firm's strategic review continues, each business area will be responsible for refining and implementing new strategies, said Hall.

The new set-up will comprise four corporate staff functions: CFO, legal, strategic development and human resources. In addition, Vattenfall's lignite mining and generation operations will be organised in a separate unit reflecting Vattenfall's ambition to sell the business.

In 2014 Vattenfall divested assets – including fossil based generation – amounting to SEK 11.6 billion, reflecting its existing strategy of shifting production to renewable energy. It invested SEK6.5 billion in wind power in 2014 and will increase this to SEK9.1 billion this year.

Last month, however, the firm said it would pull back from the troubled wave energy sector and appointed a liquidator to Aegir Wave Power Ltd., a joint venture with Pelamis Wave Power. The move follows a six-month review of the ocean energy sector.

Vattenfall launched Aegir in 2009 with the intention of developing a 10 MW array off the Shetland Islands in Scotland but said that the sector had not developed as it had hoped.

"Set against Vattenfall's pressing need to decarbonise our own power supply it has proved difficult to continue investing heavily in wave power in the absence of a commercial technology," said Bjorn Bolund of Vattenfall. The firm said it believes that Europe's wave energy sector "has long term strategic potential despite its current challenges" and that it would watch its progress with interest.

Americas

Energy storage in the Arctic

Northwest Territories Power Corporation (NTPC) has selected Saft to develop and install an extreme temperature Battery Energy Storage System (BESS) for use as part of a hybrid micro-grid that will deliver power to a community located 50 miles north of the Arctic Circle in Canada.

The system will be installed at the Colville Lake Power Station in June 2015 and will provide Colville Lake residents with consistent, renewable solar power and reduced diesel fuel consumption.

Saft will develop and install one Intensium Max 20M Medium Power (IM 20M) Li-ion battery container with 232 kWh of energy and a 200 kW Power Conditioning System from ABB. The turnkey BESS will serve as the heart of the hybrid micro-grid that is part of a larger solar and diesel upgrade to the existing power plant.

Fluor wins Diablo Canyon contract

Fluor Corporation has been awarded a five-year operations and maintenance contract by Pacific Gas & Electric Company (PG&E) to serve as the integrated services supplier for the Diablo Canyon power plant in California, USA.

Under the contract, Fluor will be responsible for site services, facility maintenance, strategic and station projects, engineering services and outage services at the Diablo Canyon facility. The two combined units produce approximately 2300 MW of power.

Brazil order for Vestas

Vestas has received a firm order from Gestamp Eolica for 53 of its V110-2.0 MW wind turbines for five wind farms in northeastern Brazil.

The contract includes supply and installation of the wind turbines as well as a 10-year full-scope service agreement. Turbine delivery is scheduled for the first quarter of 2016, whilst commissioning and commercial operation is expected in late 2016.

Asia-Pacific

Saft battery system for Japan

Saft has won its first energy storage system (ESS) contract in Japan.

The firm will supply a containerised lithium-ion (Li-ion) battery system for a remote island micro-grid demonstration project being conducted by Takaoka Toko Ltd, a subsidiary of Tepco.

The demonstration project will be located on Niijima Island and will consist of diesel generators, solar panels and wind power installations. The ESS will comprise one of Saft's Intensium Max 20 M medium power containerised Li-ion battery systems, modified to offer a nominal storage capacity of 520 kWh and 1 MW peak power output.

The battery will operate in combination with Takaoka Toko's intelligent control systems that enable large amounts of wind and other renewable energy based power to be integrated into diesel-powered grids, ensuring system stability and smooth control of the gensets. The programme will investigate the use of energy storage in operations such as ramp and frequency Smoothing.

The demonstration site is currently under construction and the installation and commissioning of the Saft ESS is planned for early 2015.

MHPS to rehabilitate geothermal plant

Mitsubishi Hitachi Power Systems, Ltd. (MHPS) has received an order from Green Core Geothermal, Inc. (GCGI) for rehabilitation work on Units No.1 through No.3 at the Tongonan geothermal power plant.

The upgrade work on the three units, each with an output of 37.5 MW, is scheduled for completion in February 2017.

The Tongonan plant is located close to Ormoc, a port city on Leyte, an island in the Visayas group in central Philippines. MHPS delivered the core equipment for the plant in 1981, enabling the Tongonan facility to support the region's power demand reliably for 34 years.

Under the rehabilitation work on order, MHPS will replace the steam path components of the three old steam turbines at the plant with its newest model.

Vestas receives China order

Jianshui Suntien Wind Power Energy Co. Ltd. has awarded Vestas Wind Systems an order for the supply of 74 MW of wind turbines for the Yunnan Jianshui Qikeshu wind farm in China's Yunnan province.

The order comprises the supply and installation of 37 units of the V100-2.0 MW wind turbine as well as a two-year service agreement. Turbine delivery is scheduled for the third quarter of 2015, with commissioning expected for the fourth quarter of 2015.

Europe

RES signs O&M contract

RES Offshore has followed up the successful installation of the West of Duddon Sands (WoDS) offshore met mast with a contract to carry out the operation and maintenance (O&M) of the met mast and equipment for the next five years.

The mast was installed in August 2014 at the 389 MW WoDS offshore wind farm in the Irish Sea for project owners Dong Energy and Scottish Power Renewables and is situated approximately 14 nautical miles off the Cumbrian coast.

The O&M services include scheduled and unscheduled maintenance on the structure, platform and lattice tower together with the maintenance of the instrumentation and power systems which also formed part of the EPC contract.

Balfour Beatty completes transmission deal

Balfour Beatty has completed the acquisition of the £352 million Gwynt y Môr offshore transmission project (OFTO).

In a deal worth £352 million, the construction group will own and operate the connection in partnership with infrastructure investor Equitix. The link is the firm's third sea-to-land power system.

The Gwynt y Môr OFTO is a high voltage transmission system connecting the 576 MW wind farm to the onshore grid. The assets include three substations – two offshore and one onshore – and over 80 km of subsea cables. Balfour Beatty's Services division is responsible for the assets' operations and maintenance under a licence granted by Ofgem with a 20-year revenue stream.

Alstom to modernise Malarenergi

Alstom has been awarded a contract to modernise a steam turbine at the Malarenergi power plant, in Vasteras, Sweden.

Alstom will upgrade two of the steam turbine's three rotors to increase their technical service life and adapt the turbine for the flow of steam from Malarenergi's biomass boiler, which runs on 100 per cent biofuel. The work will commence immediately to ensure that the steam turbine is ready for operation ahead of the heating season in autumn 2015.

The project will be managed by Alstom Power in Norrkoping.

Prysmian wins offshore wind cable contract

Iberdrola Renovables Offshore Deutschland GmbH has placed an order worth €60 million with Prysmian Group to supply and install wind turbine inter-array cables for the Wikinger offshore wind farm in the German Baltic Sea.

Prysmian will design, manufacture, install, bury, terminate and test a total of 81 km of 33 kV submarine cables in different cross-sections to connect the 70 wind turbines and an offshore substation that form the 350 MW wind farm. Installation works are scheduled to be complete by the end of 2016.

Walney prefers 8 MW wind turbines

MHI Vestas Offshore Wind has been chosen by Dong Energy as the preferred turbine supplier for phase 1 of the Walney Extension offshore wind farm.

Dong Energy has decided to split the Walney Extension offshore wind development project into phase 1 and 2, each with a capacity of 330 MW. MHI Vestas Offshore Wind has been selected as the preferred supplier for phase 1 and will supply its V164-8.0MW turbine.

The Walney Extension offshore wind farm is located approximately 19 km off the English east coast, next to the 367.2 MW Walney offshore wind farm. Based on the formal permits and timetable for the Walney Extension offshore wind farm, offshore construction of the wind farm could potentially start in 2016. However, Dong Energy has not taken a final investment decision to build the offshore wind farm.

International

Dewa awards CCGT expansion contract

Dubai Electricity and Water Authority (Dewa) has awarded a Dh1.47 billion contract to German industrial group Siemens for the expansion of the M-Station power plant in Dubai.

The expansion will increase the gas-fired facility's electricity generating capacity to 2700 MW, up from 2060 MW. The expansion project, which will be completed and delivered by 30 April 2018, supports Dewa's strategies and plans to meet the overall development needs of electricity and water.

The expansion project includes adding two gas turbine generators, two heat recovery steam turbine generators, and one back-pressure steam turbine.

Romania modernises with GE gas turbine

GE's Distributed Power business is to supply European energy developer STC SpA with an LM6000-PF Sprint gas turbine generator set as part of a project to modernise the city of Oradea's district heating plant in northwest Romania.

Romania, as well as other Central European countries, are increasingly looking to modernise their older, less efficient district heating systems to reduce emissions related to energy production.

The 250 MW Oradea thermal power plant has operated since 1966, using natural gas, oil and lignite for fuel. By installing GE's natural gas-powered 45.5 MW LM6000-PF Sprint unit as part of a broader plant overhaul, the power plant will achieve 92 per cent efficiency and reduce emissions as a reliable district heating system for the city's 141 000 inhabitants.

Siemens provides South Africa turbines

Siemens has secured a contract in South Africa to provide 157 wind turbines for three projects in Northern Cape Province.

The firm will supply 2.3 MW machines from its G2 platform to the Khobab, Loeriesfontein 2 and Noupoort wind farms, which are being developed by Mainstream Renewable Power. The contract includes a service and maintenance agreement for a period of 10 years.

The three wind power plants have a combined generation capacity of 360 MW. Turbine installation will start in August 2015. Commissioning of the three projects is scheduled from early 2016 to the end of 2017. The towers will be sourced primarily in South Africa.

GE supports Gama Enerji Assets

GE has won a 20-year contractual services agreement (CSA) with Gama Enerji for an 840 MW combined cycle power plant in Kirikkale, central Turkey.

Once the site has been commissioned – expected to happen in early 2016 – GE will provide planned and unplanned maintenance under availability and performance guarantees for two GE 9F.05 gas turbines and a GE 209D steam turbine.

Tender for Musandam IPP

A tender for selecting a consultant to provide project management and technical consultancy services for the Musandam independent power project (IPP) has been issued by the Oman Power and Water Procurement Company (OPWP) in Muscat.

The consultant will oversee construction, commissioning and testing of the 120 MW IPP, which is being developed by Musandam Power Company on a build-own-operate (BOO) basis.

Oman plans 3200 MW tender

The Oman Power and Water Procurement Co (OPWP) is planning to issue a request for proposal (RFP) for the construction of two new power plants with a combined capacity of 3200 MW, according to local reports.

Two sites, one in Ibri and one in Sohar have been finalised for the projects, the contract for which could be awarded in October 2015. One tender will be floated for both sites, with commercial operation expected to start in 2019.

Consortium wins hydro bid

A consortium Korean companies is to build two power units at the Tupolang hydropower station in the Surkhandarya region of Uzbekistan.

Hyundai Engineering and Construction Co and Daewoo International will modernise the plant by replacing two 72.5 MW power units under a contract signed with Uzbek Water Energy, a division of the Ministry of Agriculture and Water Resources of Uzbekistan.

Oil

Crude oil prices remain unsettled

- Saudi Arabia challenges shale to a price war
- Weaker shale producers may be shaken out

David Gregory

When crude oil prices began to show improvement in early February and West Texas Intermediate (WTI) started to rise into the upper $50/b range, and Brent crude returned to the lower $60s, analysts began to wonder if perhaps the market had found a floor.

But during the third week of February the US Energy Information Administration (EIA) released figures showing that US crude inventories had increased by 7.7 million barrels, marking a new record of 425.6 million barrels for the week ended February 13, the highest that US inventories have been since 1982.

That build in US stocks pushed the price of WTI down to $50/b and Brent back in the $58/b range. The report caused the *Wall Street Journal* to note that US supplies had climbed for six straight weeks and that the latest data put US output at 9.3 million b/d. Supplies are expected to continue to rise over the coming weeks, the daily said.

Burgeoning production, driven by shale oil output, has prompted Saudi Arabia and other Gulf members of Opec to challenge shale to a price war. Rather than cut output and risk their share of the global market, Saudi Arabia and the Gulf states – much to the opposition of other Opec members – have refused to slash production in order to defend prices that last summer averaged over $100/b. Instead, the Gulf states are betting that they can beat shale oil output in North America by letting the price fall to a point that shale producers are forced to halt production because it is too expensive to produce.

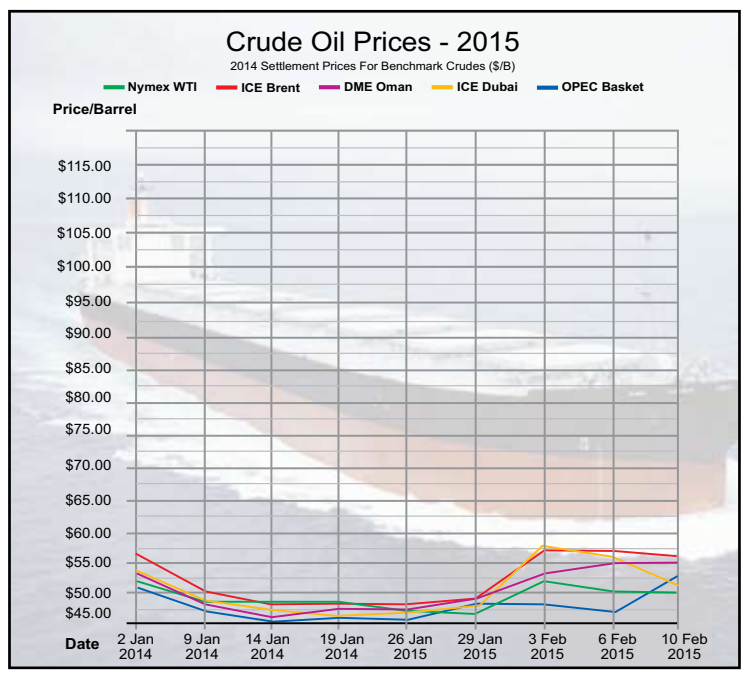
Once large quantities of shale are forced off the market and the oil glut begins to dry up, the reasoning stands, prices will begin to rise. But that begs the question: how high would the price go before it becomes commercially viable for shale producers to restart operations?

This exercise might shake some of the weaker shale producers out of the market, but those with the expertise and capital will likely return as soon as possible – and this is on the assumption that the Saudi challenge actually works. If large volumes of shale leave the market and the price begins to rise, at some point shale oil will surge back and force prices down again.

As it stands the global market is still facing large volumes of crude and despite the upturn in prices earlier last month, there is still a lot of downward pressure on prices.

For its part, Saudi Arabia is maintaining high production in defense of its stance on market share. The Riyadh-based Joint Organization Data Initiative (JODI) released data in mid-February putting Saudi crude output at 9.6 million b/d in December. JODI said Saudi Arabia exported 6.934 million b/d in December, down by 362 000 b/d from the November estimate of 7.296 million b/d. The organisation said that Saudi Arabia refined 2.217 million b/d in December, up from 1.809 million b/d in November.

However, in mid-February the US energy consultancy PIRA calculated that Saudi output was near 10 million bpd.



In its February *Short-Term Energy Outlook*, the EIA said US crude production averaged 9.2 million b/d in January and put its production forecast for 2015 at 9.3 million b/d. It forecast that US crude production would average 9.5 million b/d in 2016 and noted that the highest annual average of crude production in the US was 9.6 million b/d in 1970.

The EIA also forecast that the price of Brent crude would average $58/b in 2015 and $75/b in 2016. It said WTI prices would likely average $3/b and $4/b, respectively, below those of Brent. It also predicted that retail gasoline costs in the US would average $2.33/gallon during 2015.

Meanwhile, falling oil prices are having an impact on oil companies. Many of them have announced reductions in the amount they will invest in exploration and development in 2015, almost in all cases citing the falling price oil crude.

Despite the cutbacks, the crude oil market is expected to remain well supplied for some time. Global stocks are reported to be growing and the infrastructure used to store surplus crude are said to be nearly full. Crude production is reported to be exceeding demand by 2 million b/d.

At some point something in the market will shift, but whether that will create a situation where oil producers will have to accept lower prices for a lengthy period, or whether the Saudi plan to shake out volatile players works and the oil price returns to 'normal' will be something to watch for.

Gas

Natural gas will rise fastest, says BP Energy Outlook

Demand for natural gas over the next 20 years will rise fastest among fossil fuels, mainly driven by growing consumption in non-OECD countries, according to the BP Energy Outlook 2035.

Mark Goetz

Demand for natural gas over the next 20 years will rise fastest among fossil fuels, according to the recently released *BP Energy Outlook 2035*. Over the next two decades, demand for natural gas will rise by 1.9 per cent annually to reach around 490 billion cubic feet per day (bcf/d) by 2035.

Growth in gas demand will be driven by growing consumption in non-OECD countries, and most of this will come from Asia. Non-OECD demand is expected to grow by 2.5 per cent annually, adding 123 bcf/d to global demand, while OECD demand will rise by 1.1 per cent each year, growing by 42 bcf/d over the next 20 years.

Growing usage in the world's power and industrial sectors will account for more than 80 per cent in the total growth in demand, according to BP's data. The power sector will show the biggest gain over the period, growing by 2.3 per cent per year and increasing demand by 75 bcf/d. Industrial demand will rise 1.8 per cent annually, by 61 bcf/d.

In the non-OECD, demand within the power and industrial sectors increases usage by 100 bcf/d, while in the OECD, power sector demand adds 25 bcf/d to demand and the industrial demand increases by 12 bcf/d. Demand for gas in the transport sector will rise to 3 per cent of total demand by 2035.

Half of the increase in the demand for gas will be met with expanded non-OECD conventional gas production, primarily in Russia and the Middle East, BP said. This supply will rise by 1.5 per cent annually to add 82 bcf/d to global consumption. Almost 80 per cent of the increase in supply from the non-OECD will be from non-shale sources, whereas by 2035, North America, which currently accounts for almost all the world's shale supply, will continue to produce about 75 per cent of total global shale production.

"As demand for gas grows, there will be increasing trade across regions and by the early 2020s Asia Pacific will overtake Europe as the largest net gas importing region," the Energy Outlook says. "The continuing growth of shale gas will also mean that in the next few years North America will switch from being a net importer to net exporter of gas."

OECD shale supply will increase by 5 per cent annually, adding 52 bcf/d and accounting for about a third of the increase in global gas supply up to 2035, the report said. While shale production is dominated by North America, growth in shale elsewhere accelerates and by the 2030s it overtakes North America in volume terms.

"China is the most promising country outside North America, accounting for 13 per cent," the Outlook says. "By the end of the Outlook, China and North America account for around 85 per cent of global shale gas production," it adds.

The international trade in gas will come to be dominated by LNG, the report says, stating that 2035 LNG will overtake pipelines as the dominant form of traded gas. Production of LNG will see dramatic growth for the rest of this decade, with supply growing by almost 8 per cent annually until 2020.

The LNG market will see a growth spurt with "a slew of new projects" that will add 22 bcf/d by 2020, the report says. Overall LNG supply grows by 48 bcf/d by 2035, with Australia and the US contributing around a third of that increase with volumes of 16 bcf/d and 14 bcf/d, respectively. African LNG supply, led by East Africa, will increase by 12 bcf/d.

Qatar, which has the largest share of the LNG market today, will by 2035 be overtaken by Australia, which will have 24 per cent, by Africa with 21 per cent and by the US with 18 per cent of the market.

"Increasing LNG trade will also have other effects on markets," according to the Outlook. "Over time it can be expected to lead to more connected and integrated gas markets and prices across the world. And it is also likely to provide significantly greater diversity in gas supplies to consuming regions such as Europe and China."

The report adds that as North America reaches energy self-sufficiency – and it notes that North America will become a net energy exporter this year – and as LNG trade increases, the two will over time have a fundamental impact of global energy flows.

Continuing strong economic growth in Asia will see energy flows shift increasingly from west to east, the report says, caused by increased oil and gas supplies in the US, and lower energy demand in the US and Europe where there will be improving energy efficiency and lower demand growth.

Global installed wind power capacity (MW) – regional distribution

		End 2013	New 2014	Total (End 2014)
AFRICA & MIDDLE EAST				
	Morocco	487	300	787
	South Africa	10	560	570
	Egypt	550	60	610
	Tunisia	255	-	255
	Ethiopia	171	-	171
	Cape Verde	24	-	24
	Other [1]	115	14	129
	Total	**1,612**	**934**	**2,545**
ASIA				
	PR China*	91,412	23,351	114,763
	India	20,150	2,315	22,465
	Japan	2,669	130	2,789
	Taiwan	614	18	633
	South Korea	561	47	609
	Thailand	223	-	223
	Pakistan	106	150	256
	Philippines	66	150	216
	Other [2]	167	-	167
	Total	**115,968**	**26,161**	**142,119**
EUROPE				
	Germany	34,250	5,279	39,165
	Spain	22,959	28	22,987
	UK	10,711	1,736	12,440
	France	8,243	1,042	9,285
	Italy	8,558	108	8,663
	Sweden	4,382	1,050	5,425
	Portugal*	4,730	184	4,914
	Denmark	4,807	67	4,845
	Poland	3,390	444	3,834
	Turkey	2,958	804	3,763
	Romania	2,600	354	2,954
	Netherlands	2,671	141	2,805
	Ireland	2,049	222	2,272
	Austria	1,684	411	2,095
	Greece	1,866	114	1,980
	Rest of Europe [3]	5,715	835	6,543
	Total Europe	**121,573**	**12,820**	**133,969**
	of which EU-28 [4]	117,384	11,791	128,752
LATIN AMERICA & CARIBBEAN				
	Brazil**	3,466	2,472	5,939
	Chile	331	506	836
	Uruguay	59	405	464
	Argentina	218	53	271
	Costa Rica	148	50	198
	Nicaragua	146	40	186
	Honduras	102	50	152
	Peru	2	146	148
	Carribean [5]	250	-	250
	Others [6]	55	28	83
	Total	**4,777**	**3,749**	**8,526**
NORTH AMERICA				
	USA	61,110	4,854	65,879
	Canada	7,823	1,871	9,694
	Mexico	1,859	522	2,381
	Total	**70,792**	**7,247**	**77,953**
PACIFIC REGION				
	Australia	3,239	567	3,806
	New Zealand	623	-	623
	Pacific Islands	12	-	12
	Total	**3,874**	**567**	**4,441**
	World total	**318,596**	**51,477**	**369,553**

Source: GWEC

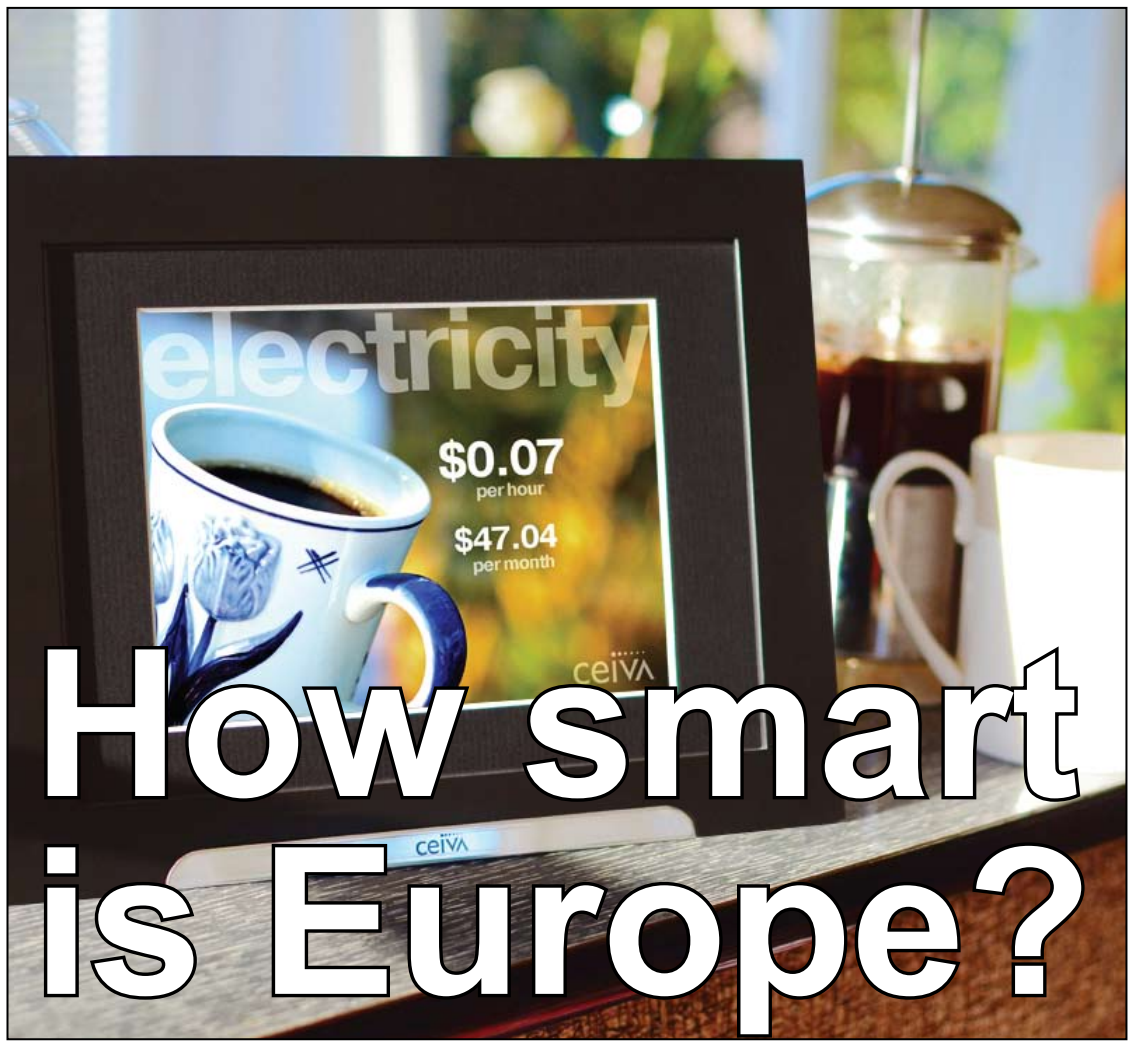
1 Algeria, Iran, Israel, Jordan, Kenya, Libya, Nigeria
2 Bangladesh, Mongolia, Sri Lanka, Vietnam
3 Bulgaria, Cyprus, Czech Republic, Estonia, Finland, Faroe Islands, FYROM, Hungary, Iceland, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta,Norway, Romania, Russia, Switzerland, Slovakia, Slovenia, Ukraine
4 Austria, Belgium, Bulgaria, Cyprus, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, UK
5 Caribbean: Aruba, Bonaire, Curacao, Cuba, Dominica, Guadalupe, Jamaica, Martinica, Granada, St. Kitts and Nevis
6 Bolivia, Colombia, Ecuador, Venezuela

Note:
Project decommissioning of approximately 523 MW and rounding affect the final sums
*** Provisional figure**
**** Projects fully commissioned, grid connection pending in some cases**

For more information, please contact:

Lauha Fried
Communications Director
Global Wind Energy Council
Tel + 32 2 213 18 98
Mob: + 32 477 364 251
Email: lauha.fried@gwec.net

Global Wind Energy Council
Rue d'Arlon 80
1040 Brussels, Belgium



How smart is Europe?

Smart meter rollout is progressing across Europe.

Junior Isles reports on the EU's programme and explores the potential benefits to both utilities and consumers.

Smart meter rollout across Europe is well underway, even if the status of the various programmes varies considerably between member states. Under the Third Energy Package of 2009, at least 80 per cent of consumers are to be equipped with smart meters by 2020 – in cases where the cost-benefit is positive.

The directive also states that, amongst other things, the active participation of consumers must become a reality. Last month's 'Smart Energy UK and Europe' conference in London, provided not only an update on smart meter deployment but also gave some insights as to how consumers could benefit.

Constantina Filiou, Principal Administrator – Smart Grids Directorate-General for Energy European Commission said active consumer participation were "the key words" in the Third Energy Package provisions for smart metering.

Pointing out that smart metering is understood to be a tool to deliver benefits to consumers in the Energy Package she asked: "So what's in it for consumers?"

According to Filiou, pilot projects and consumer engagement projects across Europe show that smart metering can benefit consumers in several ways. For example, accurate and frequent consumption data brings the opportunity to reduce energy consumption, while detailed energy consumption data allows further energy efficiency improvements to be identified.

She added: "Even more exciting, you can have access to innovative services and products. Think about smart home solutions and home automation and their potential for delivering energy cost reduction."

Recognising the potential benefits, not just to consumers but also to the entire energy system, the Commission put together a number of recommendations in 2012 in preparation for smart meter rollout.

The Commission has been monitoring smart meter rollout activities of member states over the last few years. The findings were released in a benchmarking report released on June 17, 2014. The report includes results before the accession of Croatia and therefore covers 27 countries.

The report: 'Benchmarking Smart Metering Deployment in the EU-27 with a focus on electricity' has two supporting documents – the country fiches showing the developments in each country; and a cost-benefit data analysis.

Some 21 countries have conducted cost-benefits analyses (20 were received before the cut-off date). The report shows that 16 member states have made serious commitments to large-scale (more than 80 per cent) rollout of smart metering systems for electricity. Italy, Finland and Sweden have already completed the rollout.

"We have seen that in 13 of the 16 member states with the commitment to rollout, that the penetration rate is 95-100 per cent – much beyond the target of The Third Energy Package," said Filiou.

Although she described this as "very good news", Filiou noted that it was not happening everywhere. "It's only 16 of the 27 member states we looked at," she said. "But due to the high penetration, if you translate that, you see that 72 per cent of EU consumers will have a smart electricity meter by 2020." Filiou noted that the figures include countries undertaking 'selective rollouts' i.e. where there was only a positive cost-benefit case for rolling out smart meters to certain consumers. These were Germany, Latvia and Slovakia.

This is a total of 195 million smart electricity meters, representing an investment of €35 billion. For gas the figure is about 45 million meters, worth €10 billion.

Some key rollout parameters in the cost-benefit analysis revealed a significant divergence between countries. For example, some member states saw no potential for energy savings coming purely from smart meters while at the other end of the spectrum some predicted as much as 5 per cent. Peak load shifting showed an even bigger range. Meanwhile meter costs could vary from €77 in some countries to a staggering €766, according to the Commission's study. It also noted that the benefits per metering point vary from €18 to €654.

While the Commission's study shows potential benefits will vary, it is widely agreed that customer engagement is crucial. It is arguable that the value of engaging the consumer is hard to quantify. Some players, however, believe that the value of customer engagement is in fact measurable.

Opower is a publicly held US-based Software-as-a-Service (SaaS) company that provides cloud-based software to the utility industry in order to transform the way utilities relate to their customers.

In November last year the company published a White Paper that quantifies the value of strong customer relationships.

The report – 'The Value of the Engaged Energy Consumer' – was conducted in collaboration with more than 95 of its utility partners in nine countries, including leading European utilities. Essentially, Opower used the analytics gained from working with utilities and insights from consumers to demonstrate the value of engaging the customer.

The White Paper showed that there are three main drivers around consumer engagement: customer relationships; digital engagement, e.g. giving customers – through outbound and inbound emails and websites – the ability to understand and control their bill; and effective marketing in order to sell more services.

Commenting on this last point John Webster, VP Marketing and Strategy, Opower EMEA said: "With Opower and its customer engagement platform, a utility can offer specific services or products based on personalised usage information from the customer in order to improve their energy efficiency.

"The White paper showed doing this not only improves the satisfaction of customers… but will probably make them happier to buy more services."

Opower says it has demonstrated the value of its platform with numerous utilities. Mercury Energy, one of New Zealand's largest energy retailers brought Opower's customer engagement platform to nearly 300 000 customers in 2013. In a move to improve customer relations, through its 'Good Energy Monitor' programme, Mercury started offering customers personalised feedback on their energy usage, automated billing alerts, and easy-to-understand savings advice.

"Since introducing the programme Mercury has seen percentage point reductions in churn due to increased [customer] satisfaction," said Webster. "We are able to give personalised insights on their usage as well as send 'unusual usage alerts', perhaps triggered by more air conditioning being used. Using smart meter data we can alert customers that they are on track for a higher bill."

A year after introducing the programme, Mercury also noted that it has helped the 80 000 participating households save more than 3 per cent on their energy bills – a collective annual saving of NZ$2 million ($1.5 million) – by reducing energy consumption.

Such behavioural demand response (BDR) programmes have also delivered impressive results elsewhere. Faced with skyrocketing demand during the summer and its traditional demand DR programme falling short of its goals, US utility Baltimore Gas & Electric turned to customer engagement for greater savings. A programme launched in conjunction with Opower resulted in peak demand falling by 5 per cent.

US company Ceiva Energy reports a similar experience. It has 12 utility customers in the US, the biggest of which is National Grid US. Ceiva is providing its Homeview system and related software directly into homes for a pilot project covering 15 000 homes in Worcester, Massachusetts. One of the things Homeview will allow National Grid to do is drive DR programmes.

Wannie Park, Ceiva's VP of Utility Solutions, explained: "The utility can push the DR to 15 000 homes to, for example, turn off a pool pump during the day or change a thermostat setting. The consumer would get a notification on their [Homeview] picture frame, IOS or android app or email, for example, and choose whether to opt out of the DR event. Although it is relatively early in terms of the testing… we are seeing as much as 8-9 per cent reductions."

Park also says that their system is being used in southern California to help consumers gain a better understanding of exactly what they are being charged for electricity at specific times of the day and thus control consumption.

In California extensive solar deployment has changed generation peaks, making matching supply and demand more complex. This combined with more complicated rates and time-of-use pricing has made it almost impossible for consumers to manage electricity costs.

"We are trying to bridge the communication between utility and consumer," said Park. "With the consumer being a lot more informed, it not only allows them to save money but also be more [energy] efficient.

"Not only do they get a better idea of what their rates are, and when to, say, charge an electric vehicle, they get a good understanding of what the utility is trying to achieve. It helps create a better relationship between utilities and consumers."

As Europe's utilities come under increasing pressure to maintain profits in a difficult market and improve customer satisfaction, more are looking to such consumer-related programmes in a rapidly changing energy landscape.

Opower is working with First Utility in the UK as well as EDF in France.

Its partnership with E.On announced in 2013 to launch the 'Saving Energy Toolkit' to help customers understand and transform their home energy usage, has been well publicised. The online tool shows customers where and when energy is being used and provides a breakdown of costs and information on how they compare to other customers in their local areas.

Opower's research has found that utilities can increase the return on their customer relationships by 20 to 55 per cent, and add an incremental of up to €40 annually to their bottom line for every household they engage.

With energy companies going through an image crisis in the UK, even if improved customer relationships only helps to reduce complaints, they will be on to a winner. Charter UK, a company noted that in the financial sector the cost of handling and investigating complaints could range from £25 to £100.

And ultimately the cost to the utility goes beyond this. As Andrew Aldred a Director at Charter UK summed up: "In extreme cases of customer dissatisfaction, customers will leave and take their business with them."

Making a case for storage

Although battery storage technology still needs further development, the industry does not have to wait in order to take advantage of the benefits now – it's just a case of finding the right economic model. **Junior Isles** reports.

Energy storage that is not dependent on geography is one of the missing pieces of the puzzle in the move towards building an optimised smart energy network. Such a network would be capable of balancing supply and demand in a world with a high penetration of renewables and other distributed generating sources, and where consumers are also producers.

Although battery-based utility scale technologies need further development, some argue that the industry is at a stage where users can already benefit from what is already out there.

Anthony Price, Director of the UK's Electricity Storage Network said: "There's a mismatch between supply and demand, which will only get worse as the amount of renewables increases. Storage is one of the missing links. There's a lot of new development work taking place with the technology – as there is in any industry to improve the product that you've got – but we don't have to wait for the next generation of storage to get the benefits of storage now."

This is a very fundamental point. Dozens of reports are published on storage every year, most recommending that storage technology needs to be improved and subsequently more should be invested in R&D.

Price notes, however, that these reports ignore the fact that "we have storage now".

He added: "They will also say there needs to be a better commercial and regulatory structure in order for investment to be made in storage. But what tends to happen is that people put money and attention into the R&D because that's easier than addressing the commercial and regulatory structure."

Accordingly, the ESN has been working closely with the UK's Department of Energy and Climate Change (DECC) in highlighting today's practical uses for storage and also what regulations and legislation could be put in place to support further deployment.

The UK, which is fast becoming a hot spot for demonstration projects, has four large projects funded by DECC. Each covers a slightly different aspect of storage.

In a recent conference hosted by ESN, with participation by DECC, ESN first looked at the project run by Moixa Technology, which spans 750 homes. The aim of the project is to look at the impact of aggregating numerous properties that have their own storage and distributed generation. It also discussed the project on the Scottish island of Ghigha, which uses a large vanadium flow battery to avoid constraints of electricity production from a local wind farm. The third project looks at how second-life electric vehicle batteries can be used to improve the network infrastructure in order to facilitate EV recharging. The fourth DECC-supported project is the Highview and Viridor project, which will demonstrate cryogenic energy storage.

Each project illustrates different points and problems in the UK. "One interesting problem that comes up on the Island of Gigha is the complete confusion that exists in bringing together electricity storage and renewable generation," said Price. "It's not just about the flow of electrons into and out of a battery. You also have feed-in tariffs, Renewable Obligation Certificates and the Climate Change Levy.

"There are considerable issues in dealing with Ofgem, Her Majesty's Revenues and Customs (HMRC) and the project developers in trying to reconcile the electricity and cash flows that take place. And this is where someone needs to take a sword to the regulations and chop out the ones that don't apply and put something in that's workable."

Certainly the right regulations and legislations have to be in place to bring investment into storage.

"If you are putting in an investment that has a life of 15-20 years, you will probably need a revenue stream of similar length. This means you need some certainty that that revenue stream is going to exist," said Price. "The problem is, no such certainty exists."

While investors in generation projects are provided with certainty through schemes such as feed-in tariffs, contracts for difference, capacity market mechanisms etc., there is nothing in place for storage. Price believes there should be a review of the UK market to either "remove all the market distortions" or create something that gives an investor the confidence to put money into a long-term project.

While the industry is split over whether more subsidies should be introduced to the market, it is unlikely that new money will be found for storage. Network operators and energy companies are therefore looking to generate the multiple revenue streams that most, at least in the UK, believe are necessary to make electricity storage financially viable.

While not part of the DECC programme, a lithium ion battery that recently went live in Leighton Buzzard, aims to address the economic and commercial challenges around electricity storage. One of the main goals of this installation, called the Smarter Network Storage (SNS) Project, is to demonstrate how storage can overcome network shortfalls and network constraints as well as potentially take advantage of buying or selling electricity or providing ancillary services for network support to provide an extra income stream.

Speaking at the recent 'Smart Energy UK and Europe Conference' in London, Nick Heyward, SNS Project Director at UK Power Networks, the company responsible for running the project, said: "Storage is too expensive to justify for a single application so its important to stack as many benefits as you can to maximise the value."

Commissioned in December last year the SNS Project is built next to an existing substation. The 6 MW/10 MWh system supports some of Leighton Buzzard's load during peak times, essentially deferring infrastructure investment by reducing the amount of power that the overhead lines have to carry.

Heyward explained: "This allows us to defer a significant amount of investment at the site. Without storage we would have installed a brand new 20 km overhead line from the grid supply to Leighton Buzzard and a new primary transformer at the site."

He notes that a key difference between this and other projects is the integrated commercial model that has been put in place. "We really need this; it's crucial to ensure we can operate across multiple markets."

This was highlighted in Heyward's figures. They showed that the cost of the entire SNS system is £11.4 million over the project lifetime – 69 per cent of which is the capex cost. Conventional reinforcement of the network would have cost £5.1 million, illustrating that storage would be more than twice as expensive if used purely for network support.

One of the other services the project will deliver is balancing for the national grid. National Grid currently procures a number of balancing services in the form of short-term operating reserve (STOR), fast reserve and frequency response. The source of the service can be generation, interconnectors, demand-side response or storage.

A case study undertaken by National Grid to assess the case for storage in balancing, however, showed there is no economic case when used solely for this purpose.

The company set out to answer the question: how many years would it take to recover the cost of electricity storage assets from reserve services alone? For STOR and fast reserve, it looked at five storage technologies – sodium sulphur battery; lithium ion battery, pumped hydro, compressed air energy storage (CAES) below ground and CAES above ground.

Rhiannon Grey, Balancing Analyst at National Grid noted: "The key findings were that no technology recovered its costs within its lifetime through providing STOR alone. For fast reserve, only CAES recovered its costs within its lifetime. No battery technology recovered its cost in providing STOR or fast reserve.

"What we took away from this is that for storage to be commercially viable, we need to see cost reductions or access to multiple revenue streams."

Nevertheless Grey concedes that the "changing energy landscape, may require innovative solutions in the future, one of which may be electricity storage".

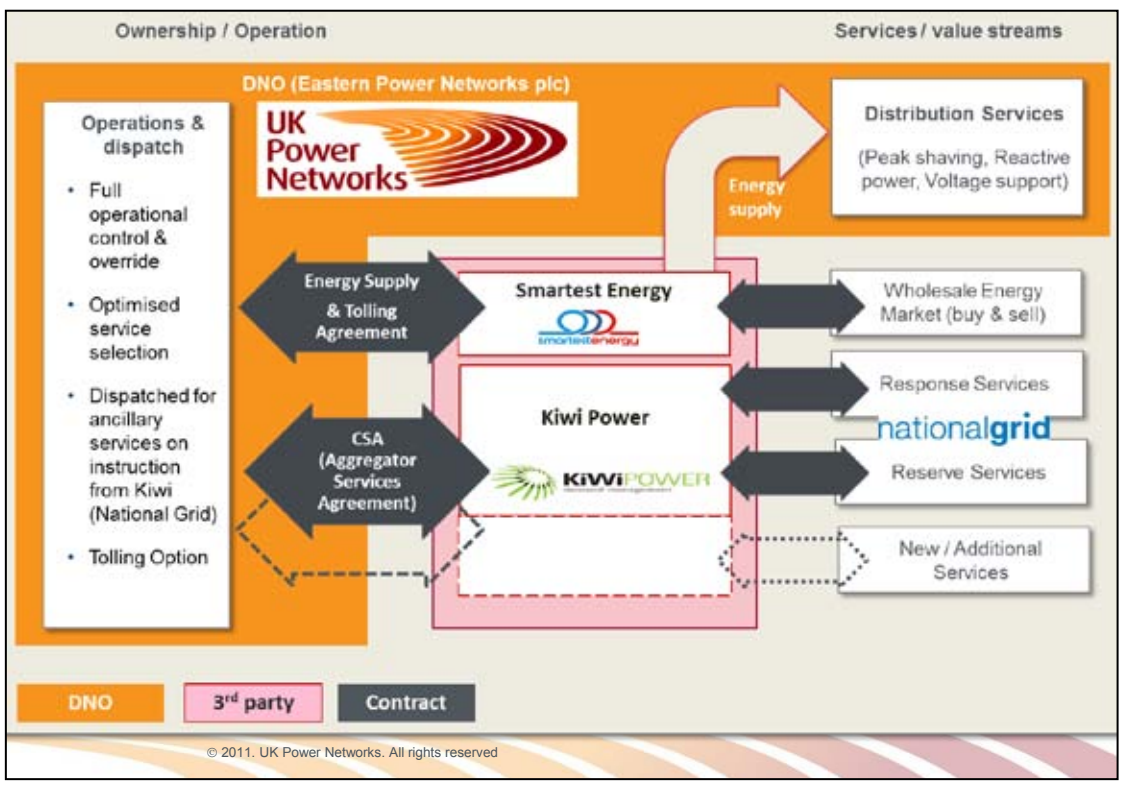
Most would agree that electricity storage has a role to play in the future of energy. As it can both absorb and release energy, it has the flexibility to help integrate renewable generation. In addition to residual balancing it can enable network operators to avoid or defer network reinforcement and could be used for peak shaving and self-consumption if introduced in homes.

There have been a number of battery projects commissioned around the world. In Europe projects have been commissioned in Germany, Spain and Italy for example. There is huge interest in India and China and just last month Saft was awarded its first energy storage system contract in Japan to supply a containerised Li-ion battery system for a remote island microgrid project on NiiJima Island.

However, it is the US that perhaps points the way forward for the UK and other markets trying to get storage off the ground.

Price summed up: "The US projects are significant because they have been commissioned in an environment where everyone sees the value of storage. They have been prepared to put either an initial cash subsidy in or offer a tax credit that gets the project over that hurdle of [making an] investment decision against an uncertain financial future."

UK Power Networks has an integrated business model to access maximum value



Lünen: an answer to several utility problems?

The energy landscape has changed dramatically in recent years with many of Europe's energy companies being squeezed from all angles. A technology to be demonstrated at a pilot project in Lünen, Germany, could potentially answer their problems. **Junior Isles** explains.

Many of Europe's traditional generators are struggling as sluggish electricity demand, legislation on carbon emissions, and the inexorable increase of renewables squeeze profit margins.

However, a solution may be at hand in the form of a technology that addresses several of the industry's issues by capturing and recycling CO_2 for the production of methanol.

In January, Mitsubishi Hitachi Power Systems Europe (MHPSE) announced the launch of a 1 MW pilot project being hosted at the Lünen power plant, Germany, owned by STEAG GmbH. The 'MefCO2' (Methanol fuel from CO_2) project will enable 1.4 tonnes of CO_2, which would otherwise be emitted to the atmosphere, to be converted into 1 tonne of methanol per day.

The technology not only provides a method of converting CO_2 to a valuable industrial product, it also offers a way of essentially storing surplus electricity from wind and solar.

Professor Emmanouil Kakaras, Head of Innovation and New Products at MHPSE explained the drivers behind the project. "We are moving towards an era of inter-disciplines between [industrial] sectors. The energy-only sector is becoming increasingly stochastic and so traditional players are trying to hedge with different options. Large capacity storage will be one of these options in years to come. And this technology involves other industrial sectors, instead of electricity only."

The Lünen pilot is essentially a carbon capture and use (CCU) project, as opposed to carbon capture storage (CCS), which presumes that CO_2 is stored underground in an appropriate onshore or offshore carbon storage site. Carbon dioxide from the coal fired plant is precipitated from the flue gases in a special downstream flue gas scrubber (post-combustion capture). The power plant's electricity is used to decompose water into hydrogen and oxygen in an electrolysis unit. Carbon dioxide and hydrogen are then converted into standard methanol (CH_3OH) in a methanol synthesis unit.

An international cooperative venture comprising a number of firms and research institutions have come together to develop the project. Belgian company Hydrogenics supplies the electrolysis unit and Carbon Recycling International (CRI, Iceland) the methanol synthesis. Also involved is Duisburg-Essen University, whose CO_2 scrubber at the power plant site has demonstrated its operating efficiency. The Hydrogenics and CRI technologies are in use commercially but not in the configuration planned for Lünen. Other partners include Genoa University, Cardiff University, the Catalysis Institute (Slovakia) and I-deals (Spain). MHPSE will be responsible for the integration and constructing the plant. In fact MHPSE was a supplier for the post-combustion capture unit that was originally installed at the site to demonstrate CCS.

Prof. Kakaras said: "This all has to work, not as an island but has to be integrated into the regular power plant operation and this is where an equipment supplier like ourselves fits into the picture."

MHPSE believes there is a business case for the technology. It says it is well suited to the way in which many baseload power plants in Europe are now forced to operate due to market conditions.

Torsten Buddenberg, Head of Product Development at MHPSE explained: "Sometimes plants will operate at the minimum load or may have to switch off overnight. Those that have to re-start might use oil, which is very expensive. Instead you could avoid switching off by using the output of a power plant running at minimum load in an electrolyser to produce methanol. It would also save on the fuel that would be needed to re-start the power plant."

Prof. Kakaras added: "You have an additional revenue stream from the methanol production that tops up the revenues from electricity sales. This increases both the overall profitability and operating hours of the power plant."

Producing methanol from electricity can be achieved with a similar efficiency as the conventional method of natural gas reforming. This means the technology will be competitive where there is a market for methanol.

Buddenberg noted: "In addition to its use in the chemical industry, methanol can be used as a supplement for normal fuel used in cars, e.g. gasoline, diesel or LPG. In Europe it is blended [with transport fuels] to about 3 per cent; in China it is blended to a minimum of 15 per cent in most states and will be going up to 85-100 per cent in the public transport sector. So although the market for pure methanol might be small in the foreseeable future, there is a good market for methanol mixing for cars."

Methanol is also eligible for certification as a renewable fuel as it can be produced using electricity from conventional plants – while capturing CO_2 – as well as from surplus renewable electricity.

"They have recognised this in Germany," said Prof. Kakaras, "and here we have the first-of-a-kind test case that could qualify methanol as a renewable fuel."

Although a tried-and-tested process, direct methanol synthesis has not as yet been used in combination with a utility power plant and under load-flexible operation. MHPSE says the reason for this is that in the past, the power industry was focused on total decarbonisation through CCS. However, with the issues surrounding CO_2 sequestration, the company believes the technology has a real chance.

"There are other alternatives [for carbon re-use] but carbon to methanol is one of the most promising and will be among the first movers because it is close to market," noted Prof. Kakaras.

Certainly the timing of the project also has much to do with stagnating European power prices. Buddenberg added that the power industry's interest is also related to the price difference between methanol and electricity, which has increased as electricity prices fall due to lower demand and the higher penetration of renewables.

Lünen MefCO2 is a four-year project. Although it is an R&D programme, it is funded as part of a public-private partnership (PPP) initiative called SPIRE (Sustainable Process Industry through Resource and Energy Efficiency). Some 80 per cent of the project's €11 million cost will be covered by the EU under its 'Horizon 2020' research programme.

Research is currently under way in the Universities in areas such as improving the performance of the catalyst used in converting CO_2 to hydrogen. They will also carry out research into electrolysers that operate at elevated temperature.

Another major part of the consortium's work will be in the engineering and permitting of the new installation.

This first part of the work is expected take about 18 months, after which construction will begin. According to MHPSE, the groundbreaking ceremony for the demonstration plant is scheduled for 2016 and operations will start during 2017.

The facility will consist of three distinct modules: the existing post-combustion carbon scrubber; electrolyser; and methanol synthesis module. Installation should take about one year, leaving the final year of the project for test runs. Various modes of operation such as start-up, shutdown, flexibility, response time etc., will be tested over about a 2000-hour period.

Buddenberg noted: "Each of the individual parts are existing technologies. The challenge or novelty is integrating them into a power plant and proving it can be controlled to react rapidly in line with the electricity grid."

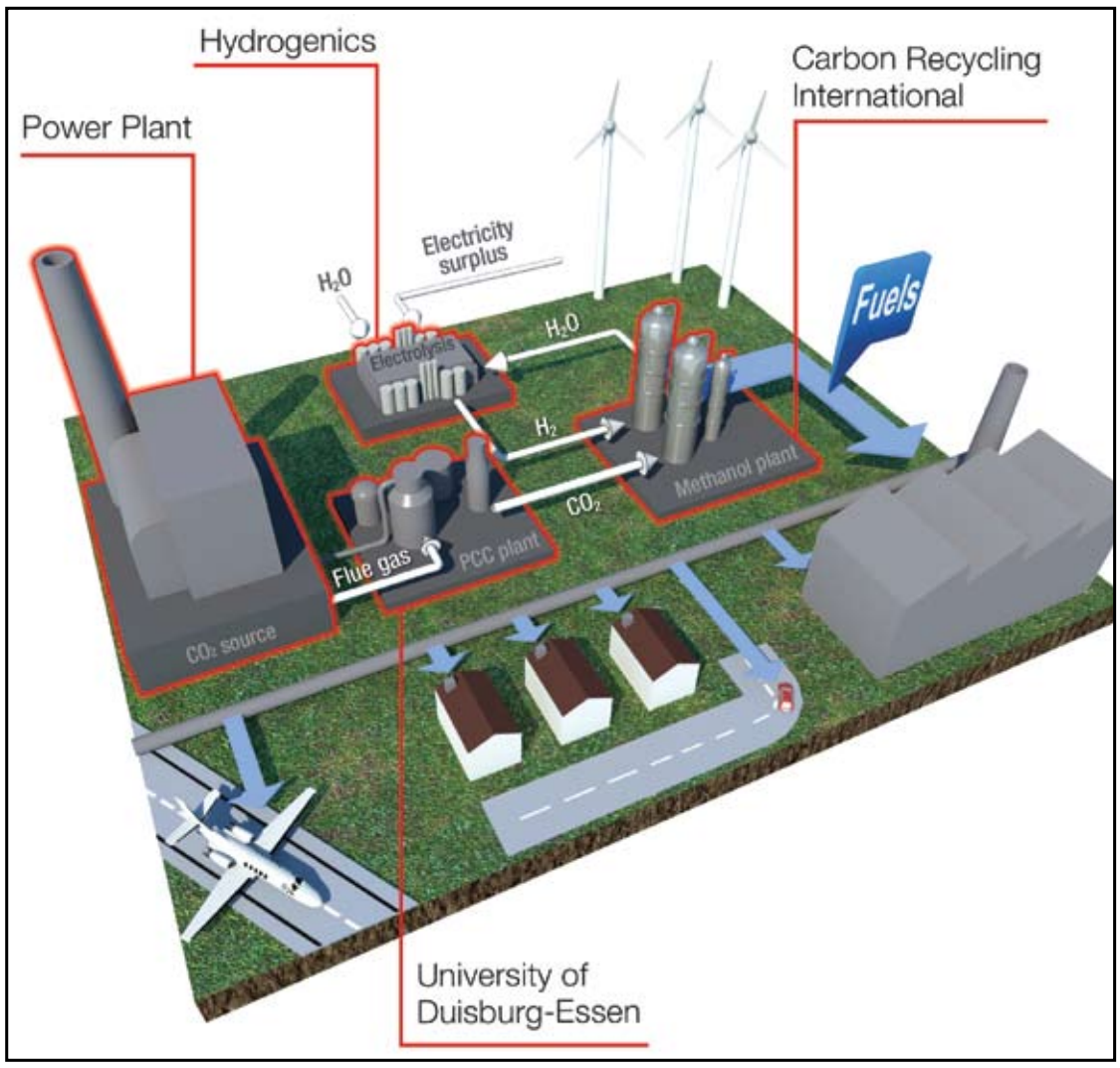
Once the facility has proven it can operate in a commercial setting, the next step will be scaling up. In parallel with developing the Lünen project, MHPSE has the responsibility for designing a full industrial-scale 50 MW facility. And looking further ahead, the company says "installations of up to 200 MW can be implemented relatively rapidly and efficiently operated". A plant of this size would produce up to 180 000 t of methanol a year and eliminate 260 000 t of CO_2.

MHPSE says it is already engaged with a number of interested customers and expects the first large-scale project to be in place around 2020/23.

While there appears to be no major challenges in scaling up the technology, as is often the case, commercial take up will depend on having a regulatory framework that favours a positive investment decision.

"Adding a flexible methanol production facility to a 700 MW coal plant would cost an additional €200-400 million," said Prof. Kakaras. He noted, however, that "some regulatory risks, mainly in the electricity market, that currently obstruct investing in large capacity storage or in backup power projects would have to be removed" in order to justify investment in the technology.

He concluded: "If there's a clear signal from the energy market to facilitate large scale electricity storage, electricity companies will invest first in such power-to-fuel technologies, because of the multiple revenue streams."



3-D illustration of the Lünen power-to-fuel facility.
(Courtesy of MHPSE)

Junior Isles

There'll be no rematch without U

On hearing that the US Department of Energy (DOE) had once again pulled funding for the FutureGen carbon capture and storage (CCS) project, I thought of calling this editorial '*Die, Monster Die!*', after the 1965 classic horror movie. But perhaps the ongoing saga is more akin to '*Rocky*'. FutureGen seems to have had more comebacks than the Italian Stallion.

The $1.65 billion clean coal project is one of the most expensive and high profile carbon capture proposals in the world. But early last month the FutureGen Alliance said it had no choice but to shut it down after the DOE suspended the majority of its funding.

The DOE confirmed that it will not provide the $1 billion in stimulus funding it had committed to the project, which aimed to refit a coal-fired power plant near Meredosia in western Illinois and store carbon dioxide from the plant underground.

It is not the first time FutureGen has been stopped. First proposed in 2003, the project initially called for building an experimental power plant in eastern Illinois. But the Bush administration pulled the plug on it, citing rising costs.

The current version of FutureGen, dubbed FutureGen 2.0, was first planned after President Barack Obama took office. The scaled-down project was promised $1 billion in federal stimulus funding.

In a statement, FutureGen Alliance CEO Ken Humphreys said the DOE decided to suspend planned funds because there is not enough time to complete the project before a required deadline under the 2009 federal stimulus package.

"The federal funding was the key component," FutureGen Alliance spokesman Lawrence Pacheco said, adding that the DOE told the alliance that the project could not realistically use the funds by the September 2015 deadline.

DOE spokesman Bill Gibbons said that the agency suspended funding "in order to best protect taxpayer interests". He added that the project had provided useful research on carbon sequestration.

The termination of FutureGen appears to be one more nail in the coffin for CCS. There are now only a handful of remaining planned projects that would capture CO_2 at scale from a coal plant. Last year SaskPower's Boundary Dam plant in Canada became the world's first commercial scale, post-combustion capture facility at a coal-fired generating station.

Coal proponents use such examples to argue that the technology still has a future. In a recent statement, the World Coal Association (WCAA) noted: "… CCUS technology is a reality, as evidenced by the Boundary Dam coal-fired power station. This pioneering project will reduce greenhouse gas emissions by one million tonnes of CO_2 annually, the equivalent to taking more than 250 000 cars off the road each year."

But a report released last month by the Canadian Centre for Policy Alternatives (CCPA) questioned the economic cost and environmental benefits of the $1.5 billion project.

The 24-page study by former CCPA Saskatchewan director Brian Banks and independent energy and environmental consultant Mark Bigland-Pritchard, suggests the project's risks far outweigh the rewards for Saskatchewan consumers.

It estimates the cost of electricity produced by the clean coal unit at "12-14 ¢/kWh and rising" as additional units are converted to CCS.

The study says SaskPower's investment in CCS technology would have been much better spent on cheaper renewable projects such as the 177 MW Chaplin wind farm, or even the 205 MW upgrade of the Queen Elizabeth II gas plant, which could produce "twice the power for a third of the cost of CCS".

Bigland-Pritchard said: "The reason why countries throughout the world have looked at [CCS] and backed off is that there is a big price-tag attached to it. Countries like Scotland or Germany or even England have noted it's cheaper to use wind, so they've gone in that direction."

In response to the report, SaskPower issued a statement which, although true, was somewhat predictable. It said: "The world-leading project at Boundary Dam Power Station Unit 3 (BD3) is providing affordable coal power to more than 100 000 homes and businesses, and in a way that is 10 times cleaner than other coal units (approximately 90 per cent reduction in CO_2 emissions)."

SaskPower also took issue with CCPA's estimated cost of the project, saying the Crown Corporation's "total investment for the BD3 carbon capture and storage project is $1.23 billion. The federal government contributed a further $240 million toward the project, for a total of $1.467 billion."

This comes across as quibbling over 'small change' in the overall scheme of things; it's still big money. A stronger argument would have been that onshore wind was not always as cheap as it is today. If given the same support that wind and other renewables has been given, we would no doubt see CCS costs come down. And while gas, is cheaper it still has a carbon footprint.

According to the WCA, in comparison to other low carbon technologies, CCUS is underfunded. It noted that the Global Subsidies Initiative has reported that nuclear and renewable energy projects (excluding hydroelectricity) receive $45 billion and $27 billion in public funds, respectively, every year. In comparison, in the decade since 2005, only $12.2 billion has been available to fund CCUS demonstration.

It is a fair point. Nevertheless, in a difficult economic climate it is unlikely that politicians will find any more money, at least not enough to make a difference, for CCS.

This is part of the reason industries have to find other ways of improving the economic case. It perhaps also explains why we have seen a subtle shift in IEA and WCA communiqués from CCS to CCUS (carbon capture use and storage).

Without finding ways to use the carbon dioxide instead of simply storing it underground it, it is hard to see how CCS will ever see the light of day.

First there is the issue of storage in itself. In a recent interview, Professor Emmanouil Kakaras, Head of Innovation and New Products at Mitsubishi Heavy Power Systems Europe (MHPSE) commented on the objections to underground storage in Germany. "If society does not accept CO_2 storage, there will be not total decarbonisation," he said.

MHPSE recently launched an R&D pilot project in Lünen Germany that will use the CO_2 generated from an existing carbon capture facility to produce methanol (*see page 15*).

Not only will the Lünen pilot avoid having to sequester CO_2, more importantly it could create an additional revenue stream through the sale of methanol and may ultimately allow the power plant to operate profitably in a market where baseload fossil fuel plants are often run at low loads as renewables take precedence.

Enhanced hydrocarbon recovery (EHR) – enhanced oil recovery, enhanced gas recovery (EGR) and enhanced coalbed methane recovery (ECBM) – has also been touted as a good use for CO_2 captured from power stations. Any oil or gas recovered through these methods would otherwise not be extracted and therefore has an economic value, which offsets some of the costs of sequestration.

However, the economics of even these will come under scrutiny with the current low oil prices.

There is no doubt that carbon capture is needed. In the industrial sector, there are no real other options. In the power sector, where countries such as China and India will remain large coal users, some argue that it is the most cost-effective tool in cutting greenhouse gas emissions.

The International Energy Agency has estimated that CCUS could deliver 14 per cent of cumulative GHG emissions cuts through to 2050 and that climate change action will cost an additional $4.7 trillion without CCUS.

But for utilities struggling to survive today, 2050 is a long way off. And unless generators are able to create revenue streams from the captured CO2, it is hard to justify commercial scale CCS projects in the power sector in the foreseeable future.

Still, the future can be unpredictable – future carbon prices and movements in fuel prices will all have an impact.

Maybe there will be no FutureGen 3.0 but it would not be the first time the project has been written-off; stranger things have happened. After all, the seventh installment in the *Rocky* series is due to hit the big screen this summer – nine years after the sixth and "final" *Rocky* movie.