

THE ENERGY INDUSTRY TIMES

June 2013 • Volume 6 • No 4 • Published monthly • ISSN 1757-7365

www.teitimes.com

Special Supplement

The Haliade 150-6MW prepares to go offshore



Nature's calling

Thomas Becker, EWEA's new CEO, talks candidly to *TEI Times*
Page 13



Final Word

Junior Isles gets the commentary on hat-tricks and own goals
Page 16



News In Brief

Utilities alter nuclear plans

The economic downturn in the USA has caused Duke Energy to suspend plans for the construction of a new nuclear power plant in North Carolina.

Page 4

Japan looks abroad to meet GHG targets

The Japanese government has decided to promote a new framework for pursuing cuts in GHG emissions.

Page 6

Industry warns of "disastrous results"

Europe's energy sector has warned that the lack of a clear and coherent energy policy for the European Union is preventing the flow of much needed investment.

Page 7

Japan steps up nuclear exports

Japan will attempt to boost exports of its nuclear power plant technology after winning a bid to build Turkey's second nuclear power plant.

Page 8

Fuel Watch: US takes step towards LNG exports

The decision to approve the application of Freeport LNG to export liquefied natural gas marks the start of a significant effort by the US to become a major global gas exporter.

Page 11

Energy Outlook: Big hopes for small packages

The US puts its weight behind small modular reactors.

Page 14

Technology: The answer is in the air

Liquid air technology has the potential to provide utility scale energy storage and efficiently turn waste heat into power.

Page 15

Advertise

advertising@teitimes.com

Subscribe

subscriptions@teitimes.com
or call +44 208 523 2573

Policy indecision threatens EU climate ambitions



Oettinger: Europe could lose many valuable jobs

The Eurozone economic crisis is pushing the need to tackle climate change down the political agenda. At the same time, indecision on post-2020 targets is hampering investment and threatening security of supply. **Junior Isles**

The European Union, which has been leading global efforts to cut carbon dioxide emissions, is becoming increasingly indecisive on energy policy in the face of difficult economic conditions.

At last month's EU Summit to discuss energy and tax evasion issues, there seemed to be a shift in energy policy as the EU said it would prioritise the supply of energy at affordable prices over reducing greenhouse gas emissions.

The EU's energy commissioner Günther Oettinger admitted that energy had been made deliberately more expensive in the past. "For one thing,

to solve our budgetary problems. And secondly for energy efficiency: one is more frugal with expensive things," he said.

However, high energy costs are becoming an increasing problem for Europe's poor, and also drive European industry elsewhere. Oettinger said gas and electricity are significantly cheaper in the US and that competitive disadvantage should not be simply tolerated, or else Europe would de-industrialise and lose many valuable jobs.

A draft conclusion of the EU leaders' meeting obtained by *Kyodo News* said:

"Against the backdrop of high pressure on Europe's competitiveness and increasing energy demand from major economies, the EU's energy policy must ensure the uninterrupted supply of households and companies at affordable and competitive prices."

The draft said investments in new and intelligent energy infrastructure are "vital for jobs and growth and will help enhance competitiveness." The EC calls for "a predictable climate and energy framework post-2020," according to the paper.

The EU remains committed to emissions reduction targets under the 1997

Kyoto Protocol, under which it pledged to cut greenhouse gas emissions by 20 per cent below 1990 levels by 2020. However, it has been slow to set targets further into the future.

Commenting on the region's post-2020 goals, one EU official said: "The European Commission is already in 'do nothing' mode on climate change, and it will obviously put off a decision on ambitious targets."

Market observers have also warned that Europe needs a less fragmented energy policy, particularly in terms of

Continued on Page 2

Signs of optimism at Bonn climate talks

There were no major breakthroughs at the latest round of climate talks in Bonn, Germany, but there were renewed signs of optimism.

Instead of arguing over the agenda, negotiators got down to work, discussing ways to ramp up countries' emissions reduction commitments now and move toward a 2015 international climate action agreement.

One key issue discussed was 'Spectrum of Commitments'. The idea put forward by the US is that every country should determine its own national "contribution" to curbing global climate change and present it to the international community. A "spectrum" of various commitments would thus emerge, which could be included in

some sort of formal agreement.

The idea opened up a much needed conversation about the concept itself and how it would work in practice. One key question that still remains is how to ensure that nationally offered commitments add up to a level of action that keeps global average temperature increase below 2°C.

One important piece of news from the week-long talks was that officials broadly agreed that any new Treaty agreed in 2015 would have to be significantly more flexible than the Kyoto Protocol.

There is a consensus building that the new treaty will incorporate ambitious emissions targets and climate action plans. However, it will also

feature mechanisms that allow for these targets and strategies to be made more ambitious as the science demands, or as new emission reduction technologies emerge.

Such flexibility would significantly increase the likelihood of a deal being reached in 2015.

Bonn also saw the launch of a new prototype registry, managed by the UNFCCC, which will provide a central database for recording all the "Nationally Appropriate Mitigation Actions" taken by governments. The database is intended to make it easier for countries to track each others' progress towards cutting emissions and share policy best practices.

The latest round of international

climate negotiations resumed as new data showed that atmospheric carbon dioxide hit record levels.

Speaking at the opening of the talks Christiana Figueres, the head of the UN's climate change secretariat, warned diplomats they "must do more and do it faster".

She warned governments had already used a third of the time between the 2011 Durban commitment to finalise a new international treaty and the 2015 deadline for agreeing that treaty.

Talks in Bonn lay the groundwork for this year's UN Climate Summit in Warsaw and more importantly the Paris Summit in 2015 where governments are committed to signing up to a new international climate treaty.

Continued from Page 1

supporting renewable energy.

“European-level ambitions for the renewable energy sector will only be realised with a more coherent and stable pan-European perspective on the financial returns investors should expect,” said Cornelius Brandi, chairman of law firm CMS.

Europe’s utilities also slammed European governments for inconsistent policy frameworks, with each member state promoting renewable energies separately.

The heads of Europe’s leading utilities recently criticised lawmakers at the EU and national level for failing to provide a market environment that incentivises investment in new energy infrastructure, from production of energy to transporting and storing, while containing the related costs.

Last month, chief executives from eight leading energy utilities warned that the European energy industry’s “perilous situation” needs to be addressed urgently.

The CEOs, including Enel’s Fulvio Conti, Gérard Mestrallet of GDF Suez, José Ignacio Sanchez Galan of Iberdrola and E.ON’s Johannes Teyssen, said that “the lack of visibility and regulatory uncertainty will inevitably lead to an absence of energy investments with negative effects on security of supply, employment and reactivation of the European economy”.

“The status quo is simply not an option,” they added in a statement.

The joint statement from the heads of the European utilities – which also includes Gertjan Lankhorst of GasTerra, ENI’s Paolo Scaroni, Peter Terium of RWE and Gas Natural’s Rafael Villaseca Marco – iterates the urgency of the situation.

“European energy companies are experiencing a perfect storm which is endangering security of supply and the transformation towards a low-carbon economy, as well as undermining their capacity to attract capital,” the statement said.



Brandi: renewables could lose out

The comments come as the collapse of the EU’s carbon dioxide emissions trading scheme, once the flagship in the bloc’s fight against global warming, raises questions about the effectiveness of Europe’s energy policy.

The statement noted that a revitalised EU energy policy, including an improved market design and a functioning carbon market, would “restore the confidence” of energy companies and investors in the sector.

Brandi said that Europe’s renewables sector could lose out against other regions of the world if it fails to adopt a new energy policy approach. Countries like Saudi Arabia and Japan have recently announced massive investment into or generous support mechanisms for renewable energies.

Discussions on measures to combat global warming have also lost momentum as the European Union focuses on steps to boost the economy ahead of the European Parliament election scheduled for May next year.

Obama could flex US muscle through more gas exports

Greater oil and gas production in the US could break the link between oil and gas prices and give the US even greater geopolitical leverage.

The administration of US President Barack Obama is seeing the surge in domestic oil and gas production as a turning point in US energy politics. There was further evidence of this last month when the US Department of Energy approved the application of Freeport LNG to export liquefied natural gas globally.

The approval of construction of an LNG terminal for unrestricted exports,

i.e. also to countries that do not have trade agreements with the US, is seen as a move that will allow the US to have even greater influence on the world political stage.

Obama said: “I’ve got to make an executive decision broadly about whether or not we export liquefied natural gas at all. I can assure you that once I make that decision, then factoring in how we can use that to

facilitate lower costs in the hemisphere and in Central America will be on my agenda.”

The shale gas revolution in the US has seen gas prices there plummet to about one third of the price of imported LNG in Europe and about one quarter of the price in Asia.

Tom Donilon, the national security adviser said at the end of April that the US’s new energy posture” allows it to

“engage [with the world] from a greater position of strength”. In a speech in New York he said the new energy bounty gave the US “a stronger hand in pursuing and implementing” its international security goals.

He also noted that increased US and global gas production could break the link between gas prices and the higher oil prices, and could “weaken control by dominant natural gas suppliers”.

Coal solution in sight for Indian power producers

- New committee to strike deal between power producers and SEBs
- Government to issue show cause notices to captive coal block holders

| Syed Ali

India is close to solving some of the coal issues that continue to affect its power generation sector.

Major Indian power companies have been hit by increases in coal import prices as the country struggles to deliver domestic coal.

Indian regulations require power producers to strike pre-sales agreements over the price at which they will sell electricity to state electricity boards (SEBs). These are normally binding, even if power producers’ fuel costs increase.

Now a new committee has been set up to carve out a new deal between power producers and various SEBs. In April, regulators ruled that Tata and Adani, the country’s two largest generators by installed capacity, could

pass on a portion of their increased costs to SEBs.

In late May, Industrialist Gautum Adani told the *Financial Times* newspaper: “The government is quite serious on this. I think in the next one month this committee will give their view in a report, and with that basically I think most of the difficulties facing the power sector will be removed.”

Power producers have been forced to import expensive coal due to India’s inability to meet domestic demand, despite having extensive coal reserves.

Last month it was reported that the government is set to issue show cause notices to the holders of at least 30 captive coal blocks. Companies holding these blocks will be asked to explain why they failed to develop them and if the government is not satisfied

with their responses, the allocations may be cancelled.

If the allocation of these 30 blocks or some of them is indeed cancelled, it would be the first such exercise since December last year.

In August, the Comptroller and Auditor General, the government auditor, said in a report that the allocation, rather than auction, of coal blocks between 2005 and 2009 had caused notional losses to the tune of Rs.1.86 trillion to the national exchequer.

Following this, between October and December, the government cancelled the allocation of at least 15 coal blocks and encashed the bank guarantees of at least 14 others on the grounds that they had failed to develop them.

The government is likely to put up at least 36 new coal blocks for auction. These, however, will not include the

15 allocations that have so far been cancelled.

The Central Bureau of Investigation (CBI), which is inquiring into all allocations since 1993, submitted its status report on the alleged coal scam before the Supreme Court on 8 March. The report has not been made public yet.

On April 23, a parliamentary panel that had reviewed the process of the coal block allocations, said in a report that all allocations since 1993 should be cancelled.

On May 10, law minister Ashwani Kumar resigned after the CBI said in an affidavit in the Supreme Court, that he, along with officials from the coal ministry and the Prime Minister’s office, had effected changes in its status report on coal block allocation irregularities.

Industry fears impact of anti-dumping duties on Chinese solar panels

| Junior Isles

There is a growing voice of concern over the potential impact of anti-dumping duties on Chinese solar panels.

As the EU prepared to vote on whether to slap duties of up to nearly 70 per cent on some Chinese panel producers, the UK’s Solar Trade Association (STA) wrote a letter to EU Trade Commissioner Karel de Gucht urging the Commission not to impose anti-dumping duties. The letter was signed by 15 European trade associations across 12 countries, showing the level of opposition to the duties.

At the end of May, Paul Barwell,

CEO of the STA said: “We showed the Commission the damage their proposals are already causing for the UK solar industry. Jobs, growth and carbon and renewables targets will be at risk if these duties are applied on the 5th June.”

Earlier, the Alliance for Affordable Solar Energy (AFASE), a coalition of over 450 companies in the European Photovoltaic (PV) industry also voiced its concern.

AFASE, representing more than 41 000 European Union (EU) jobs, said in a statement, “Punitive tariffs, no matter at what level, would cause irreversible damage to the entire European PV value chain.”

This would cost the EU PV industry and the whole of the EU economy “dearly”, added AFASE, citing a study by the independent research institute Prognos showing that duties of 60 per cent would cost the European economy up to 242 000 jobs and €27 billion (\$35.5 billion) over the next three years.

Wouter Vermeersch, CEO of the Belgian company Cleantec Trade, echoed the view. “The solar business is very price sensitive. If prices are artificially increased by punitive tariffs, the European solar market would simply come to a standstill with disastrous effects on green jobs,” he said.

Following a sustained stretch of severe declines from February 2012 through the end of the year, solar polysilicon pricing has stabilised in early 2013, with prices steady in April and early May, and expected to rise slightly during the following months.

According to the information and analytics provider IHS, prices stabilised at \$20.40 for March and April and average pricing during the next three months will rise to \$20.50. The stabilisation and increase in pricing came despite the trade disputes. It said that delays in the EU’s decision on the dispute actually boosted pricing, as demand weakened in Europe.

platts | www.platts.com/euronuclear | Utilities Rate Available!

June 26-27, 2013 | InterContinental Warsaw, Poland

8th Annual European Nuclear Power Conference

Can nuclear new build succeed in Europe?

Sponsored by:

Special intervention from:
Prof. Jerzy Buzek
 ▶ European Parliament Rapporteur of the ITRE committee
 ▶ President of the European Parliament: 2009 - 2012
 ▶ 9th Prime Minister of the Republic of Poland: 1997 - 2001

Aleksander Grad President of the Management Board PGE EJ 1 and PGE Energia Jadrowa	Dominique Lagarde Senior Executive Vice President, New Nuclear Engineering EDF
Alan Svoboda Executive Director Sales and Trading CEZ	Zbigniew Kubacki Director, Nuclear Energy Department, Ministry of Economy, Poland
Hergen Haye Head of Nuclear New Build, Department of Energy & Climate Change (DECC) UK Government	Peter Faross Director for Nuclear Safety and Fuel Cycle European Commission

Key issues to be explored:

- ▶ Europe in the context of international nuclear development
- ▶ Establishing nuclear power in Central and Eastern Europe: plans, status and achievements so far
- ▶ New build momentum and uprate potential in Europe: opportunities, risks and timescales
- ▶ Nuclear power in the context of evolving EU energy policy frameworks
- ▶ Having the ability to act - attracting investment, developing skills and maintaining public support in the current climate

REGISTER NOW!
 www.platts.com/euronuclear | +44 (0)20 7176 6300
 conf_registrations@platts.com | +44 (0)20 7176 8512

An excellent event for professionals!
 Jerzy Majcher
 Mott Macdonald Polska Sp

FT
FINANCIAL TIMES

THE FT GLOBAL RENEWABLE ENERGY SUMMIT

22 October 2013 | The Millennium Hotel | LONDON

The Financial Times Global Renewable Energy Summit will bring together leading renewable energy and utility leaders, government decision makers, economists, financiers and investors to assess how the economic, financial and political framework for renewables is evolving, and the implications of growing renewable deployment for the future shape of the energy industry.

Other speakers include:

- **Reza Abhari**, Professor of Energy Technologies, Laboratory for Energy Conversion, *Swiss Federal Institute of Technology*
- **Nick Butler**, Visiting Professor and Chair, King's Policy Institute, *King's College London*
- **Damian Darragh**, Financial Managing Director, *Terra Firma Capital Partners*
- **Anthony Hobley**, President, *Climate Market and Investment Association (CMIA)*

Early bird discounts now available - save **£300** by registering before 28 July. **THE ENERGY INDUSTRY TIMES** readers please quote **FTEIT.01** to claim a further 20% discount when registering online.

www.ft-live.com/renewablesummit
 @FTLiveTweets #FTRenewable

Supported by

THE ENERGY INDUSTRY TIMES | **Financial Times Live** is the global conferences and events arm of the **Financial Times newspaper**. For more information go to www.ft-live.com

SPEAKERS

Luca Bettonte Chief Executive Officer ERG
Steve Howard Chief Sustainability Officer, IKEA Group
Christof Rühl Vice President and Chief Group Economist, BP

An event from FINANCIAL TIMES LIVE

Have you got a thirst for technology, networking and industry insight?

Place yourself at the forefront of the smart energy revolution.

15-17 October
 Amsterdam
 The Netherlands

FREE exhibition entrance (save € 295)
 Promotional code: teit
www.european-utility-week.com

smart t&d infrastructures	renewable integration & storage	smart metering ict & data management	smart homes end-user engagement
---------------------------	---------------------------------	--------------------------------------	---------------------------------

European Utility Week

Utilities alter nuclear plans

Jamil: Harris site not eliminated from long-term consideration



■ Duke suspends Harris project ■ GEH chosen for North Anna 3

The economic downturn in the US has caused Duke Energy to suspend plans for the construction of a new nuclear power plant in North Carolina.

The utility has notified the US Nuclear Regulatory Commission of its decision but says that new nuclear generation has not been eliminated from its long term consideration.

Meanwhile Dominion Virginia Power has informed the NRC that it plans to switch the type of nuclear reactor it would use at its proposed North Anna 3 site because of “changes in the

marketplace”.

It says that if it goes ahead with the project it will deploy GE’s ESBWR reactor rather than the US-APWR as originally planned.

Progress Energy – which merged with Duke in 2012 – submitted an application to build two AP1000 reactors at the Harris site in Wake County in 2008. Duke says that its latest forecasts of energy needs indicate that “two additional nuclear units at Harris will not be needed in the next 15 years”.

Duke has invested \$9 billion in a

fleet modernisation programme that brought three natural gas-fired power plants back into service in 2012, with a further plant scheduled to come on line later this year.

Natural gas prices have dropped dramatically in the USA in the last few years because of a boom in production. The trend has made natural gas fired generation the best option for electricity companies while dampened energy demand has reduced the need for new generating capacity.

Duke says that it is continuing with

its application for two new AP1000 units at the Lee site in South Carolina.

“The Harris site is well suited for new nuclear generation and has not been eliminated from our long-term consideration as a site to expand our nuclear fleet,” said Dhiaa Jamil, Duke Energy executive vice president and president of Duke Energy Nuclear.

Dominion Virginia Power says that the GE-Hitachi ESBWR would be more economical to buy, simpler to operate than the MHI-designed APWR reactor, and in “the best

interests” of its customers. It told the NRC that the change in its plans would be “the best solution to the company’s need for future baseload generation” of electricity.

The NRC is still reviewing the GE-Hitachi design, but is expected to certify the new reactor type this year, according to Dominion Virginia Power. It is likely to approve the utility’s application for a combined construction and operations license for the proposed third nuclear unit by the end of 2015.

DOE releases FutureGen EIS

■ EIS crucial to funding decision ■ Rockport project dealt blow

| Siân Crampsie

A draft environmental impact statement (EIS) released by the US Department of Energy (DOE) says that the proposed FutureGen 2.0 power plant would not have any significant environmental impacts.

The 62-page document has been released for public consultation and considers 19 environmental resource areas surrounding the Illinois project.

The \$1.65 billion project involves

retrofitting the former Ameren coal plant in Meredosia to include oxy-combustion technology and carbon storage. The EIS will help the DOE to determine whether to fund the project’s final design, construction and initial operation.

In Indiana, meanwhile, the future of a proposed coal-to-gas project is in doubt after state lawmakers passed legislation requiring regulators to review the \$2.8 billion project.

The Rockport coal gasification

facility would convert coal into substitute natural gas for distribution in the region’s pipeline network as well as liquefied carbon dioxide for use in enhanced oil recovery operations. The state of Indiana had originally agreed to purchase the project’s natural gas output for 30 years, but this contract will now be reviewed.

The project is controversial because of the impact that the energy purchase contract would have on consumers’ energy bills.

DOE launches new hydrogen partnership

Companies from the automotive, natural gas, fuel cell and hydrogen industries have been brought together in a new public-private partnership focused on advancing hydrogen infrastructure in the USA.

H2USA has been officially launched by the US Department of Energy (DOE) and aims to support the development of advanced ‘green’ transportation technologies such as fuel cell electric vehicles (FCEVs).

The initiative is part of President Barack Obama’s “all of the above” approach to energy policy and will help the USA to reduce dependence on oil imports as well as increase its competitiveness in the global market.

“By bringing together key stakeholders from across the US fuel cell

and hydrogen industry, the H2USA partnership will help advance affordable fuel cell electric vehicles that save consumers money and give drivers more options,” said Assistant Secretary for Energy Efficiency and Renewable Energy David Danielson.

Current members of the H2USA partnership include the American Gas Association, Association of Global Automakers, the California Fuel Cell Partnership, the Electric Drive Transportation Association, the Fuel Cell and Hydrogen Energy Association, Hyundai Motor America, ITM Power, Massachusetts Hydrogen Coalition, Mercedes-Benz USA, Nissan North America Research and Development, Proton OnSite, and Toyota Motor North America.

“The fact that a number of entities are coming together to work together through this partnership is a very positive sign,” said Morry Markowitz, President & Executive Director, Fuel Cell and Hydrogen Energy Association.

Recent development of the USA’s shale gas resources has not only helped to cut electricity and transportation costs, but is also helping to reduce the costs of producing hydrogen and operating hydrogen fuel cells. While American automakers and private industry have made significant progress, H2USA will bring experts together to identify and solve key infrastructure challenges, including leveraging low cost natural gas resources, says the DOE.

Colbun plans new capacity

Chile’s Colbun SA is to invest \$3 billion in order to add 1000 MW of new generating capacity to its portfolio.

The company’s investment plans will help Chile to meet its rapidly growing energy demand, which is being driven by strong industrial growth.

The country needs to double its installed capacity to around 30 000 MW, but lengthy approval processes and legal hurdles are delaying key energy projects.

Among Colbun’s plans are a 316 MW hydropower project, which is scheduled to come on-line in 2013,

and a 144 MW hydropower plant in Los Rios region. It is also in the early stages of developing geothermal power concessions. Colbun owns and operates 15 hydropower plants, six thermal plants as well as transmission assets.

In April the firm pushed back the estimated start date of its proposed floating storage and regasification (FRSU) import terminal because of difficulties with finding a suitable location for the flagship project.

It is developing the FRSU with AES Gener – another key Chilean electricity generator.

Renovalia Reserve expands

Electricity demand growth and a stable regulatory regime for renewable energy has allowed Renovalia Reserve to expand its operations into Mexico, the company says.

Renovalia Reserve has commissioned its first wind farm in the country and is currently building a second. Together the two projects will add 228 MW of capacity to the Mexican electricity grid.

John Barry, Board Member of Renovalia Reserve, said that Mexico provided a “fertile environment” for growth. “Growth in electricity demand is expected to continue to trend upward based on the pace of population and industrial and manufacturing growth, and the legal and regulatory framework signals stability and predictability of renewable energy policies for the region,” he said.

Renovalia Renewables is a joint venture between The First Reserve Energy Infrastructure Fund of First Reserve, the largest global private

equity firm exclusively focused on energy, and Renovalia Energy, a global renewable energy developer.

The projects in Mexico will double Renovalia Reserve’s global installed wind capacity. The first project, at 90 MW, has been operational since June 2012 while the second – a 137.5 MW facility – is expected to start operating in 2014.

“We are very impressed by the commitment shown by the Mexican Authorities in promoting the development of clean and competitive renewable energy,” said Jaime Galabart CEO of Renovalia Energy and Director of Renovalia Reserve.

Experts predict that Mexico will need 45 GW of new electricity capacity within the next 15 years to meet future demand. In addition, the development of wind power is critical to meet government renewable targets.

Mexico recently passed a carbon law that mandates 35 per cent of energy to come from renewable sources by 2024.



Southeast Asia keeps nuclear door ajar

Ongoing safety preparations indicate Asean countries have not completely closed the door on nuclear. **Syed Ali**

Although several southeast Asian countries have shelved commercial nuclear programmes, developments are ongoing to improve their safety infrastructure.

Thailand, Malaysia, Indonesia and the Philippines have all delayed their nuclear development plans under the International Atomic Energy Agency's (IAEA's) Asian Nuclear Safety Network (ANSN), following the accident at Japan's Fukushima Daiichi nuclear plant in March 2011.

Last month, however, Pongkrit Siriprom, director of the Bureau of Safety Regulation under Thailand's Office of Atoms for Peace, noted that these countries have yet to scrap their nuclear ambitions and are still putting safety and regulatory systems in place.

He said Thailand should prepare for nuclear development, although the country has decided to postpone nuclear power projects from the original 2026

target. Independent nuclear adviser Prof Pricha Karasuddhi said Thailand is ready to implement the programme but political will is still a challenge.

Indonesia has continued surveying possible locations for a nuclear plant with the possibility the country's first reactor would start in 2019.

Malaysia's nuclear power plant feasibility study will not be ready until late 2014 and the construction of the first plant might start after 2021.

So far, Vietnam is the only Asean country that has been undeterred by the accident at Fukushima. The first units of its planned nuclear plants in Ninh Thuan province are still expected to come on stream by the end of 2020.

Ninh Thuan 1 and 2, which will be built by Russia and Japan, respectively, will each have a generating capacity of 2000 MW.

During a meeting in Hanoi in late April, Yasuaki Tanizaki, Japan's

Ambassador to Vietnam said the feasibility report for Ninh Thuan 2 would be ready in English by the end of May and submitted to the Vietnamese government in July.

There is still strong public opposition to nuclear elsewhere, however. Last month thousands of people took to the streets in Taipei to protest against further development of nuclear power on the island.

The demonstration was launched by an environmental protection organisation the day before the first anniversary of President Ma Ying-jeou's second-term inauguration.

Taiwan currently has three nuclear powerplants in operation. The decision to construct the fourth was taken by the Taiwan Power Company during the 1980s but the project has caused public controversy.

Demonstrators are demanding a nuclear-free country and an immediate

stop to the construction of the fourth nuclear power plant, located in the densely populated northeastern part of the island.

According to local reports, protestors held banners and flags that read "No Nuclear Power" and "We Don't Want Another Fukushima".

Meanwhile, in Japan the Nuclear Regulation Authority (NRA) has started a process to check whether Japan's two operating nuclear reactors are safe enough to be allowed to remain online beyond July when new safety requirements will take effect.

If the NRA acknowledges that the two reactors operated by Kansai Electric Power Co. have no serious safety issues, they will be allowed to continue operating through September, when they will have to undergo mandatory routine checks.

Operators of reactors that are currently offline will have to wait for

the requirements to come into force before applying for their restarts.

In late April an International Atomic Energy Agency (IAEA) team said Japan might need longer than the projected 40 years to decommission the crippled plant at Fukushima. Juan Carlos Lentijo, head of the IAEA team, said that damage at the Fukushima Daiichi plant is so complex that it is "impossible" to predict how long the cleanup may last.

North Korea is nearing completion of an experimental light water reactor, with the facility potentially ready to begin a start-up period by mid-2013 if fuel is available, a US think tank said last month, citing commercial satellite imagery. Noting that the start-up period normally takes nine to 12 months, the think tank said, "under a best-case scenario", the reactor could become fully operational by the first half of 2014.

4th Annual

European Electricity Ancillary Services & Balancing Forum

Ensuring Paralleled Demand and Capacity in a Harmonised European Electricity Market

The Westin Grand Berlin, Germany, 11th – 13th September 2013

Including Interactive Pre-Conference Workshops on 11th September:

Workshop A: Use of Plexos to Assess the Operational Costs Effects of Grid Integration, Ancillary Services and Balancing

Workshop B: Developments in Balance Management in Europe

Gold Sponsors:

UNICORN systems

WÄRTSILÄ

Media Partner:

THE ENERGY INDUSTRY TIMES

For more information please contact:

Kristiyan Sokolov, Media & PR Coordinator on Tel: +357 22 849 408 or E-Mail: KristiyanS@marcusevansuk.com

marcusevans conferences

ufi Approved Event
EP Shanghai 2013
上海国际电力展 2013
The 9th International Exhibition on Electric Power Equipment and Technology

Electrical Shanghai 2013
ELEC 上海国际电工展 2013
The 8th International Exhibition on Electrical Equipment

The Leading Electric Power Exhibition in Asia
2013.10.30 - 11.1

Shanghai World Expo Exhibition & Convention Center
Shanghai, PR China

Since 1986, organized by China Electricity Council, endorsed as UFI Approved Event

1,000 global suppliers and 20,000+ trade visitors from China & 50 countries

International pavilions from France, Germany, Russia, Taiwan & USA

Theme Zones in Smart Grid, Power Quality, LV Electricals, Instrumentation, New Energy

Concurrent Event
EPA 2013
电力自动化展
www.EPChinaShow.com/EPA

Official Website

www.EPChinaShow.com



ep.china

Sponsor



China Electricity Council

Organizer

China Electricity Council International

Supporter

ADSALE 裕式 ufi
Adsale Exhibition Services Ltd

Enquiry

Hong Kong : (852) 2811 8897

Singapore: (65) 6235 7996

Email: power@adsale.com.hk

Japan looks abroad to meet GHG targets

- Bilateral offset credit mechanism launched
- Goldman Sachs to invest in renewables

Junior Isles

Japan is looking overseas in its effort to meet its greenhouse gas (GHG) emissions targets.

The Japanese government has decided to promote a new framework for pursuing cuts in GHG emissions, under which Japan will claim reductions achieved in emerging countries in Asia and Africa as a result of technical assistance provided by Japan, according to the *Associated Press (AP)*.

The move comes in the face of the country's difficulties in reducing GHG

emissions domestically due to a major expansion in thermal power generation following the crisis at the Fukushima Daiichi nuclear complex in March 2011.

The new system, known as the bilateral offset credit mechanism is to be included in Japan's growth strategy to be compiled this month [June].

According to the Ministry of Economy, Trade and Industry, the system is designed to make it easier to promote the transfer of GHG rights than is possible under the existing multilateral framework.

Japan will provide environmental technologies in fields such as coal-fired power generation and energy-saving, helping emerging countries to deal with growing energy use while at the same time addressing global warming.

Japan plans to start promoting the new system during the current fiscal year by accelerating talks with emerging countries in Asia and Africa, including Indonesia, Vietnam, Kenya and Ethiopia, according to the *AP*.

The international finance community is also set to play a major role in reducing Japan's GHG emissions.

In May, US investment bank Goldman Sachs said it plans to invest about Yen300 billion (\$2.9 billion) into Japanese renewable energy projects over the next five years. The bank said that a long-term scheme to buy renewables at fixed rates would provide a stable source of income.

Goldman Sachs recently set up a wholly-owned renewable energy management firm in Tokyo. Its first move will be to invest in mega-solar facilities in Ibaraki Prefecture that will cost Yen13 billion and provide a total of 40 MW of power, the *Nikkei* reported.

Construction of the project is to commence shortly, with operations expected to begin in 2015. The Goldman unit will invest several billion yen with the remainder financed by Shinsei Bank in the form of loans.

Meanwhile, last month saw the commemoration marking the completion of Japan's biggest solar power plant at a seaside industrial zone in the city of Oita on the country's southernmost main island of Kyushu.

With a capacity of 26.5 MW, the plant can provide electricity to some 9000 households a year.

Pakistan urged to reform

Pakistan will have to reform its power sector if it is to attract the investment needed to increase generating capacity and put an end to chronic power shortages.

Syed Ali

Japan says it is ready to help Pakistan combat its power shortages but has called for reform of the country's power sector.

The Japan International Cooperation Agency (JICA) said it has identified four 400 MW units at the Mangla hydropower plant and a coal fired plant at Thar that can be replaced with Japanese assistance.

Pakistan has suffered from severe power shortages across the country, with some parts having experienced blackouts for up to 18 hours. Eradicating power shortages was declared a top priority in the recent election campaigns.

JICA's chief representative in Pakistan, Mitsuyoshi Kawasaki, said his agency is financing and engineering the study of coal-based mega-thermal power plants and also examining the possibility to locate a power plant on

the Indus River.

Pakistan has one of the largest coal reserves in the world. Estimates suggest the country has enough to generate tens of thousands of megawatts of electricity for 200-300 years.

Kawasaki said Pakistan has almost "infinite reserves" of coal spread over 900 km². Development is, however, complicated, he said.

Developing coal mines and power plants requires billions of dollars and Pakistan would therefore need assistance from international financial institutions, which advocate comprehensive power sector reforms.

A critical part of the power sector reform is rationalisation of tariffs and its impact on the general public.

Kawasaki pointed out that power tariffs in Pakistan are on the same level as tariffs in Japan, or nearly 15-16 cents per unit. Experts and political parties in Pakistan, however, maintain that an increase in tariffs is not sustainable.

The Asian Development Bank and the US Agency for International Development have already agreed to finance the conversion of the 675 MW Jamshoro oil fired plant to a coal-fired plant.

Last month Karachi Electric Supply Company (KESC) and Sindh Engro Coal Mining Company (SECMC) inked a memorandum of understanding to construct a 600 MW power plant at the Thar coal field.

According to the agreement, SECMC – a joint venture between Engro Powergen and the Government of Sindh – will develop the mine mouth power plant in Thar field's block 2. KESC will purchase power from the plant to meet the rising power demand in Karachi and adjoining areas of Sindh and Balochistan.

Both the parties say that the agreement will form the basis of a mutually beneficial partnership for future progress and development of one of the largest coal reserves in Pakistan.

EVN prepares power price roadmap

Vietnam state-owned power utility, Electricity Vietnam (EVN) is calculating power production input costs to prepare a roadmap for power price adjustment.

Based on the prime minister's Decision 24/2011 on power price adjustment in line with market changes, a road map for power price adjustment will be launched soon.

Dang Huy Cuong, director of the Electricity Regulatory Authority of Vietnam under the Ministry of Industry said the ministry is still awaiting a report from EVN regarding the plan.

The ministry has asked EVN to recalculate the cost of power production in light of coal price hikes and the actual operation of local power plants.

Vietnam's coal-fired power plants are also bracing for the effects of tighter coal imports from Indonesia, the world's top exporter of thermal coal.

Meanwhile, local businesses remain on tenterhooks in the face of the looming electricity price hikes. Analysts warned that businesses already struggling to survive would sink if their burden were increased.

Head of the Ministry of Finance's Price Management Department Nguyen Tien Thoa, said EVN had three proposals on the table for price rises between 5 and 10 per cent.

Thoa said electricity production input costs had risen by 3.3 per cent since the last price rise in December last year.

NZ could have raised more from privatisation

New Zealand's government says it could have raised more from the sale of a 49 per cent stake in state-owned Mighty River Power company were it not for interference from opposition political parties who opposed the sale.

The government secured a sale price of NZ\$2.5 (\$2.10) a share, raising a total of NZ\$1.7 billion (\$1.4 billion). The government gave preference to local investors over institutions or foreign buyers. It said 113 000 New Zealanders had become shareholders, the most for any listed company.

"Labour and the Greens certainly did their best to damage the offer," said Tony Ryall, the Minister for State Owned Enterprises.

After the share offer opened in April, the Labour and Green parties announced a plan to create a single government buyer for wholesale electricity. The parties said the policy, which they would implement if they won national elections next year, would make electricity cheaper for consumers.

Their announcement dragged down the share prices of power companies already listed on the stock market and forced the government to issue a supplementary risk disclosure to the Mighty River Power share offer.

Preparations are now underway for the initial public offerings (IPOs) of Genesis Energy Ltd. and Meridian Energy Ltd. Six banks have been invited to pitch for lead roles in the proposed IPOs of the two utilities.

The IPOs would see up to 49 per cent of each company offered to investors. Analysts think selling 49 per cent stakes in Meridian Energy and Genesis could raise more than NZ\$3.2 billion.

The government said in December it expected to raise about NZ\$6.1 billion from the sale of all three utilities.



Meralco teams up with Chubu on LNG power project

Meralco PowerGen Corp., a subsidiary of Manila Electric Co., and Chubu Electric Power Corp. of Japan are teaming up for the construction of a 1500 MW liquefied natural gas power plant in Quezon province.

"Meralco PowerGen, in partnership

with Chubu Electric, are working under a joint study agreement to assess the construction of a LNG combined cycle fired power plant and regasification facility in Atimonan, Quezon," said Meralco PowerGen senior vice president Angelito Lantin.

He said the company is waiting for the issuance of the environmental compliance certificate for the proposed project.

Lantin said if there is no significant opposition, the project is expected to be online by August 2018.



Industry warns of “disastrous results” in energy sector

The EU risks a “lost decade” of investment in energy because of a lack of coherent policy and clear vision for the future of the sector.

| Siân Crampsie

Europe’s energy sector has warned that the lack of a clear and coherent energy policy for the European Union (EU) is preventing the flow of much needed investment to the sector.

The warnings came as heads of state gathered in Brussels for the European Council meeting on energy on 22 May.

Trade group Eurelectric echoed a recent warning from eight of Europe’s major utilities saying that Europe faces a “lost decade” without investment unless clear policy signals are formulated.

Eurelectric believes that Europe’s “weak and uncoordinated” policies will lead to “disastrous results”, including rising carbon emissions and increasing energy prices.

“A lost decade of investment is the worst of all worlds: expensive in

the beginning, and drastically more expensive in the end,” said Eurelectric Secretary General Hans ten Berge. “Its ‘crawl today, sprint later’ approach is fundamentally unsustainable. Policymakers cannot afford to stick their heads in the sand in the hope of somehow ‘muddling through’: in-decision today locks in higher costs tomorrow.”

Eurelectric says that Europe can still achieve its energy and climate goals, as well as a carbon-neutral power sector by 2050, but only if “conflicting and contradictory policy signals” are removed. Steps that should be taken include agreement on 2030 greenhouse gas reduction targets and reform of the EU Emissions Trading Scheme (ETS).

In May UK lawmakers also said that investment in the EU’s energy system was being held up because of a lack of clear EU energy policy.

The House of Lords EU Sub-Committee for Agriculture, Fisheries, Environment and Energy published its report on an eight-month long inquiry, expressing its “alarm” at the degree of uncertainty and complacency about affordable, secure and low carbon energy supplies.

Committee Chairman Lord Carter of Coles said: “It is clear to us that investment is urgently required, notably in a low carbon, interconnected and innovative energy system that makes us less reliant on imports of highly volatile and dirty fossil fuels.

“Such investment would help to deliver secure and low carbon energy, boost European economic growth, and stabilise household and industrial costs.”

The Committee believes that more funds held by institutional investors would be released for energy projects if energy policy were more coherent.

“The value of energy companies has slumped since 2008, the public purse is severely constrained, but more than enough money is around in the investment community,” said Lord Carter. “This should be a great time to invest in long term assets, such as energy, but clear policy is needed in order to release it.

“We need leadership and direction from the EU and its Member States in developing and agreeing an energy policy framework through to 2030.”

Analyst firm IHS Cera has also examined European energy policy and believes that market reforms are required at EU level in order to safeguard the region’s future supplies.

It estimates that about 130 GW of gas plant across Europe – around 60 per cent of the total installed gas fired generation in the region – are currently not recovering fixed costs and are at risk of closure in the next



Lord Carter of Coles: clear policy is needed

three years.

“Reforms of the power market are becoming urgent to ensure the security of Europe’s electricity supply,” says Fabien Roques, head of European power at IHS CERA.

“While reforms are under discussion across Europe, there is a patchwork of proposals from different governments and what is needed is a coordinated approach.”

The European Council in May stressed the need for a “predictable climate and energy policy framework post-2020” and a well-functioning carbon market to attract the required finance in the region.

It said in its conclusions that it “welcomes the Commission’s Green Paper on a 2030 framework for climate and energy policies and will return to this issue in March 2014, after the Commission comes forward with more concrete proposals.”

NSN takes shape

Statnett says that it is ready to submit a license application to the Norwegian Ministry of Petroleum and Energy for the first electricity link between the UK and Norway.

The Norwegian utility has signed an agreement with National Grid of the UK to continue working on the proposed 1400 MW link, which it says is a “high priority” project for both companies.

The link would be the world’s longest subsea interconnector and would also support key European energy policy objectives, including the further integration of the north European power markets and strengthening of the north European grid.

In May the European Council on energy reaffirmed the EU’s policy objectives of completing the internal energy market and developing interconnections in order to end isolation from energy networks by 2015.

The NSN interconnector will also help to support the production and consumption of renewable energy, particularly around the North Sea basin.

“Joining of the energy systems of both countries will bring much wider benefits – delivering secure and affordable power to consumers as Europe moves towards integrating its renewable energy,” said Steve Holliday, National Grid’s CEO.

Ministers in the UK are considering plans to make shale gas extraction projects more palatable for local communities.

While the country remains in the early stages of shale gas exploration, the prospect of ‘fracking’ operations has led to strong protests from communities in rural areas where shale gas deposits are located.

The government could propose a range of policies designed to persuade residents to drop their opposition, including cheaper energy bills and funding for new community facilities.

Like other European countries, the UK is keen to exploit shale gas reserves and emulate the natural gas boom seen in the US in order to improve security of supply. However there remains strong opposition from environmentalists and

concern that a dash for gas would lock countries in to greenhouse gas emissions associated with gas for 30 years.

“It will be essential that we explore carbon capture and storage for gas-fired power stations,” said Lord Smith, Chairman of the UK’s Environment Agency.

According to Lord Smith, shale gas could “provide a significant part of the UK’s energy needs” and could also be exploited safely with the right regulations in place.

In April The UK’s Committee on Climate Change released a report into shale gas, concluding that it could enhance security of supply and boost tax revenues. However it said that it was too early to say whether shale gas would help to reduce energy prices.

“It is still too soon to call whether shale gas will provide the silver bullet needed

to solve our energy problems,” said Committee Chairman Tim Yeo. “Although the US shale gas has seen a dramatic fall in domestic gas prices, a similar ‘revolution’ here is not certain.

“If substantial shale resources do turn out to be recoverable in the UK – and community concerns can be addressed – then it could limit future energy price rises, reduce our reliance on imported gas and generate considerable tax revenues.”

However some are sceptical as to whether European countries can emulate the USA’s shale gas revolution because of differing geology, regulations and well decline rates.

Dr. James Buckee, Chairman of oil firm EnQuest, said in May that the UK was “very unlikely” to have a shale gas revolution. “I’ve been involved in shale

gas in North America for quite a long time and I’ve invested quite heavily in it and it is my conclusion that the UK is very unlikely to reproduce the US shale gas revolution,” said Buckee.

One of the key factors that could affect the growth of the UK’s shale gas industry is the fact that royalties from underground shale gas resources will automatically go to the UK government, rather than to landowners, as occurs in the USA.

Another reason, according to Buckee is the fact that shale gas well production declines by as much as 60-70 per cent in the first year of operation, necessitating the drilling of many wells. In some parts of the USA, hundreds of wells are being permitted each quarter. “I just don’t see this happening in the UK,” said Buckee.

UK looks to sweeten shale gas deals

Japan steps up nuclear exports

■ First project for Atmea1 ■ Japan seeks nuclear exports

Siân Crampsie

Japan said last month that it would attempt to boost exports of its nuclear power plant technology after winning a bid to build Turkey's second nuclear power plant.

The Ministry of Economy, Trade and Industry (METI) has unveiled a strategy to triple sales of infrastructure systems in the transport, energy and industrial sectors to Yen30 trillion (\$296 billion) by 2020, including nuclear power plant orders worth around Yen2 trillion (\$19.75 billion).

The strategy came after a trip to the Middle East and Turkey by Japanese Prime Minister Shinzo Abe, during which it was announced that a

consortium of Mitsubishi Heavy Industries (MHI) and France's Areva had been selected to build a new nuclear plant on Turkey's Black Sea coast.

Turkey will now start technical negotiations with the two companies over the project, which could see the construction of the world's first Atmea1 nuclear reactor at Sinop.

The \$22 billion project could include up to four such units. Turkey sees nuclear energy as an essential part of its energy policy and meeting its growing electricity demand.

Other projects in the pipeline aimed at increasing generating capacity include a new coal fired plant and several wind energy projects.

Construction of the plant is scheduled

to begin in 2017 and the first unit would come on line in 2023. Firms from Canada, China and South Korea also participated in the tender for construction of the plant.

Russian firm Rosatom is building Turkey's first nuclear power plant at Akkuyu. Turkish firm EUAS is expected to take a 25 per cent stake in the Sinop project company while GDF Suez will be the operator.

Turkey's use of nuclear energy is controversial because the country is prone to earthquakes, while concerns have been expressed about the safety of Japan's nuclear energy technology since the Fukushima nuclear disaster in March 2011.

Japan is keen to export its nuclear

technology in order to boost economic growth. Prime Minister Abe said in May that the lessons learned from Fukushima would be carried through to future projects.

The Sinop plant would have a generating capacity of up to 4600 MW. The Atmea joint venture between Areva and MHI was set up in late 2007 and has focused on marketing Atmea1 to new and emerging nuclear power countries.

Turkey's technology selection is the culmination of a process begun by the country's government in 2008.

In May Turkey's Hattat Holding and China-based Harbin Electric International signed a deal to build a coal-fired power plant in northwest Turkey.

The 2640 MW plant in Amasra will

cost about \$2.4 billion to build and will be fuelled with locally produced coal.

Turkish Energy Minister Taner Yıldız said the agreement showed the attractiveness of Turkey for foreign investors. "We are at work to get other coal mines online to generate power by speeding up the related tenders," he said.

May also saw the startup of a 143 MW wind farm in Turkey built by Enerjisa, a joint venture between E.On and Turkey's Sabancı Holding.

The wind farm is the largest in Turkey and is located in the northwestern province of Balıkesir.

The Turkish Wind Energy Association says that over 60 wind farms are now operating in Turkey, with a further 23 under construction.

Grand Inga developer sought

The first phase of construction of the world's largest hydroelectric plant will start in October 2015 after the Democratic Republic of the Congo re-launched the selection process for a developer.

The 40 000 MW Grand Inga hydropower project on the Congo River has been revitalised by an energy cooperation treaty between DRC and South Africa for the sale of energy from the first phase of the project, known as Inga 3.

Key stakeholders and partners in the Grand Inga project met in Paris in May to discuss the next steps of development of Inga 3, which would have a capacity of around 4800 MW.

South Africa would take 2500 MW of Inga 3's output. "We have affirmed our commitment to the project by already provisioning for this purchase in our budgetary plan," says Garrith Bezuidenhout, Chief of Staff of the Ministry of Energy of the Republic of South Africa.

Key supporters of Grand Inga, which has an \$80 billion price tag, include

the Southern Africa Development Community (SADC), the New Partnership for African Development (NEPAD) and the World Energy Council.

Grand Inga could produce up to one-third of Africa's energy needs but there are concerns over its environmental impact as well as corruption and political volatility in DRC.

Significant other barriers to the development of the project also exist, including the transmission of energy to demand centres and financing, although the African Development Bank, the World Bank, the European Investment Bank, the French Development Agency and the Development bank of Southern Africa are all involved in Grand Inga.

Three consortia are involved in the project as candidates in the competitive selection process for the role of developer: Sinohydro and Three Gorges Corporation from China; Actividades de Construcción y Servicios (ACS), Eurofinsa and AEE from Spain; and the Daewoo-Posco-SNC Lavalin consortium from Korea and Canada.



Eskom signs renewable PPAs

■ Concerns over grid development
■ Eskom plans 100 MW wind project

The South African government says that the country's electricity grid should be strengthened in light of the large volumes of renewable energy scheduled to be built.

Local reports last month quoted Director General at the Department of Energy, Nelly Magubane's concerns over the ability of the grid to cope with large numbers of distributed renewable energy plants that are being developed under the Renewable Energy Independent Power Producer Programme (REIPPP).

South African utility Eskom in May inked power purchase agreements (PPAs) with developers for nine solar photovoltaic (PV) projects under the

second round of the REIPPP. Seven wind power projects, two small hydro and one concentrated solar thermal (CSP) project were also approved.

The solar PV projects will add 417 MW of capacity to the grid while the other ten projects will add a further 627 MW.

In all, South Africa plans to add 3725 MW of renewable energy capacity to its grid under REIPPP. The first round of REIPPP contracted 28 projects, most of which are now under construction. The third round submission deadline for bids is in mid-August 2013.

Separately, Eskom has announced that it is to build a 100 MW wind farm

near Koekenaap in the Western Cape. The \$258 million project will be on line in 2014 and is the utility's first large-scale renewable energy project.

"[The project] demonstrates our commitment to reducing our carbon footprint and to investing in a sustainable energy future," said Eskom Chief Executive Brian Dames.

The project has been funded by a group of development finance institutions, including the World Bank, African Development Bank, Clean Technology Fund and Agence Française de Développement.

Eskom says that it is ready to connect new renewable energy producers to the grid.

Revitalised: The 40 000 MW Grand Inga hydropower project on the Congo River



Georgia boosts hydropower

Tata Power, Clean Energy Invest and the IFC InfraVentures Foundation have started work on several hydropower projects in Georgia after signing an agreement last month.

India's Tata Power and Norway's Clean Energy Invest will each hold a 40 per cent stake in the Adjaristsqali hydropower cascade project, which will add 400 MW to Georgia's power

system. InfraVentures will hold the remaining 20 per cent stake.

The \$700 million project will be built in three phases, with the first, 186 MW phase completed by mid-2016.

Energy from the project will be primarily exported to Turkey.

"Georgia is a great country to work in and Turkey is a fast-evolving energy market in Europe. This relation-

ship with Clean Energy and IFC InfraVentures puts us on a strong footing to take advantage of the considerable potential of this market," said Anil Sardana, managing director of Tata Power.

IFC InfraVentures is a fund created by the IFC in 2008 to develop public-private infrastructure projects in the world's poorest countries.

Special Project: Haliade 150-6MW

Ready to go big offshore

The recent achievement of power curve certification of the Haliade 150-6MW wind turbine and the imminent installation of the first prototype in an offshore setting heralds the final step in the start of the commercialisation of the new generation large offshore wind turbines.

Junior Isles

The turbine features 73.5 m blades, jointly developed with LM Wind Power

There is no disputing the potential of offshore wind power generation. According to the Global Wind Energy Council, it could meet Europe's energy demand seven times over and could generate more than four times the required energy demand in the US.

Europe is currently the hot spot for offshore wind, with more than 90 per cent of the world's offshore wind power installed in the region. Studies by the European Wind Energy Association (EWEA) have identified 18.4 GW of consented offshore wind farms in Europe and future plans for offshore wind farms totalling more than 140 GW. Grid-connected offshore wind capacity in Europe has now passed 5 GW, with the bulk of that capacity being located in the UK.

As countries realise the potential of offshore wind, the size of offshore wind farms has been growing in terms of total project capacity and the size of individual turbines.

Several manufacturers are now busy preparing a new generation of large (over 6 MW) offshore machines so that they are ready for deployment in the latest rounds of large offshore wind programmes in key European markets.

Alstom's 6 MW Haliade 150 offshore wind turbine is one such machine that has recently achieved some

key milestones in the journey towards commercial readiness. The turbine has already been identified as the preferred technology for Round 1 of France's offshore wind programme and is now being certified so that it is ready for the UK Round 3 programme.

The UK's Crown Estate launched the site allocation process for the third round of UK offshore projects in 2008 and construction of the first projects is scheduled to commence in 2014. It is envisaged that Round 3 will be on a much bigger scale than its predecessors. Rounds 1 and 2 comprise 8 GW of generating capacity, while Round 3 alone could deliver a further 25 GW.

In line with this schedule Alstom is on the brink of achieving the final certifications that will allow it to be offered commercially.

Jordi Puigcorbé, Alstom Wind Vice President of innovation explained: "As soon as you have a prototype machine, there are three stages: the first is commissioning of the machine, followed by validation of the systems, with the final stage being the certification. We are working very hard with the prototype we have at Le Carnet, near Saint-Nazaire."

The Haliade 150-6MW is a three-bladed upwind wind turbine, which operates at a variable speed and has a maximum rated power of 6 MW. The

turbine has 73.5 m blades, jointly developed with LM Wind Power, giving a rotor diameter of 150 m that covers a swept area of 17 860 m². According to Alstom, the new blade and larger rotor swept area improve annual energy production by 15 per cent compared to the current generation of offshore turbines.

The turbine has been designed to meet Class I-B specifications of the IEC-61400-1/IEC-61400-3 standards. It is suitable for sites with a reference wind speed of 50 m/s (10-minute average) and a 50-year extreme gust speed of 70 m/s (3-second average).

The Haliade 150 is equipped with a direct-drive permanent magnet generator and includes three identical full-power converters operating at 900 V. This voltage can then be increased by means of a transformer included in the turbine.

The inverter, transformer, switchgear and low voltage electrical distribution cabinet are located at the tower base. A distribution cabinet in the nacelle supplies the pitch, the yaw and the cooling fans and collects signals from the sensors. The entire wind turbine is air-conditioned and pressurised.

Unlike some offshore wind turbines, the Haliade machine has been developed specifically for the offshore wind market. Construction materials and protection treatments are specifically

designed for offshore environments. Heat exchangers and pressuring units prevent salty air entering while dehumidifiers prevent corrosion of components inside the wind turbine.

Commenting on the design, Puigcorbé noted: "We didn't take an onshore machine and modify it for offshore. When we began the design in 2009, the plan was to start from zero. We took into account the environment in which the machine has to operate as well as all technical and operational aspects that would contribute to the cost of energy from the turbine."

This meant that all the boundary conditions were considered before defining the type of technology and product details. Alstom first identified the targeted cost of energy and split this into the costs of items such as jackets and foundations, as well as all the turbine systems – the major components such as the tower and drive train. It also took into account the electrical infrastructure of the wind farm as a complete power plant.

Puigcorbé added: "With a power plant out at sea, there are other factors such as the cost of operation and maintenance that will have a big impact on the final cost of energy. When you combine all of these parameters, you are able to define what is the best product."

Special Project: Haliade 150-6MW

“Ultimately you reach several conclusions: you determine the aspect ratio between the turbine power and the [blade] diameter; the target weight of the nacelle; the expected energy output; and the class of equipment for which the turbine has to be designed. You can even compare different technologies in terms of drive train to conclude, for example, that the optimal is the direct drive.”

Whether a direct drive or geared machine is best suited to large offshore wind turbines is a “hot and dynamic debate” in the industry.

Puigcorbé commented: “It’s clear that if you make the same analysis for onshore machines of about 3 MW as we did for offshore, the most competitive drive train would be double-fed technology with a gearbox. For offshore, in order to reduce the capex you have to move to bigger and more powerful machines – 6, 7 or even 8 MW. When you consider all the boundary conditions, especially the cost of maintenance, the most competitive drive train in terms of cost of energy is the direct drive. The dominating factor is the reliability of the machine.”

The high cost of working out at sea makes turbine reliability critical. With no mechanical gearbox coupled to the generator, the direct drive turbine

consists of fewer rotating parts. According to Alstom, this increases reliability, maximises turbine availability and reduces maintenance costs. The use of a permanent magnet generator (PMG) is also said to lead to better generation efficiencies and even greater overall mechanical reliability.

The use of a direct drive train also helps to reduce the total head mass of the turbine i.e. the nacelle plus the rotor. The Haliade 150-6MW has a total head mass of 370-390 t depending on the configuration.

Puigcorbé explained the significance of this: “The weight that you put in the top of the tower has a big impact on the structural loads. This is a key factor in the design and development of the tower and foundations, which in turn has a big impact on the capex of the wind farm. If you can design lighter, cheaper foundations you reduce all the related costs such as transport, installation and the cost of the actual equipment.”

Alstom says the Haliade 150 generates up to 40 per cent more electricity per kilogram of material used than today’s offshore machines.

A key feature of the turbine is Alstom’s Pure Torque load deflecting design, which protects the generator and improves its performance. The design has been applied in both its existing

onshore and offshore turbines.

Explaining the philosophy behind Pure Torque, Puigcorbé said: “Mechanical components should not be used as structural components. For example in a standard onshore machine, you connect all of the components – rotor, blades, hub and shaft – to the gearbox. This means the gearbox is being used as a mechanical component to transmit the torque, and as a structural component. In addition to the torque, the gearbox has to withstand the bending moments coming from the blades. This is a mistake and is one of the reasons why you have a lot of gearbox failures. The gearbox is designed to withstand torque but not bending moments.”

At the EWEA conference earlier this year, Alstom cited a study by Relia-wind, which said that the failure rate of even the best theoretical gearbox designs does not go below 6.8 per cent and that gearboxes are likely to face at least one replacement over 20 years. Alstom calculates that this translates into an extra €500 000-800 000 over the lifetime of a 6 MW geared turbine.

Pure Torque separates structural loads from mechanical loads to ensure that only the turning force from the blades – torque – is transferred to the mechanical systems i.e. the generator.

Haliade 150-6MW specifications

Operating data

Wind Turbine Class	1-B IEC-61400-1 / IEC-61400-3
Rated Power	6.0 MW (net after transformer)
Cut-in wind speed	3m/s
Cut-out wind speed (10 min average)	25m/s
Grid frequency	50 / 60Hz

Rotor

Rotor diameter	150m
Blade length	73.5m
Rotor swept area	17 860m ²
Rotor speed range	4 – 11.5rpm
Tip speed	90.8m/s

Generator

Type	Direct Drive Permanent Magnet
Rated voltage	900 V per phase
Number of phases	3 x 3
Protection class	IPP55

Converter

Type	Back to back 3-phase AC/AC
Output voltage	900 V

Tower

Type	Tubular steel
Hub height	100 m (or site-specific)

Power control system

Type	Variable speed and independent pitch control by blade
------	-------------------------------------------------------

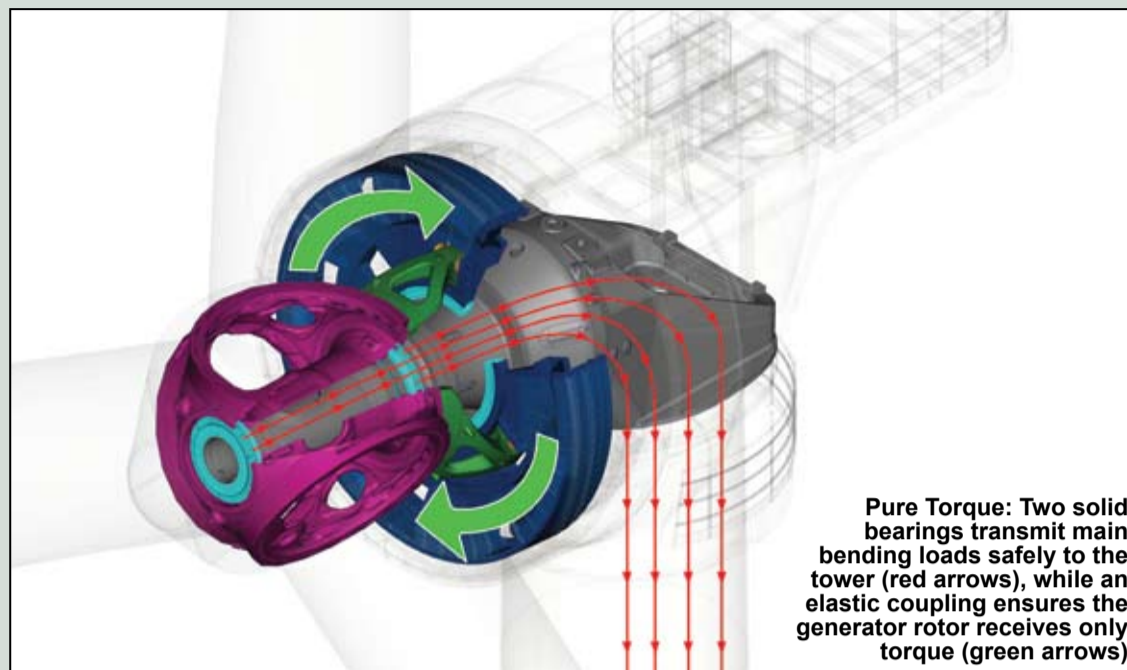
Environmental specifications

Normal air temperature range	-10 to +40°C
Extreme air temperature range	-30 to +50°C
Lightning protection	Class I acc. IEC 62305-1

Alstom’s 6 MW Haliade 150 offshore wind turbine has recently achieved some key milestones



Special Project: Haliade 150-6MW



Pure Torque: Two solid bearings transmit main bending loads safely to the tower (red arrows), while an elastic coupling ensures the generator rotor receives only torque (green arrows)

Bending loads from the blades are transmitted down the tower.

"In an onshore machine with a gearbox, Pure Torque allows us to reduce the failure rate of the gearbox, and in the offshore direct drive machine, it reduces the failure rate of the generator," added Puigcorbé.

Ensuring the generator is subjected only to torque allows the minimum required air gap to be maintained between the generator rotor and stator at all times. This ensures high electrical efficiency.

"The stability of the air gap between the generator rotor and stator is very important. The generator of the offshore machine has a diameter of about 7.5 m. To maintain efficiency, the distance between the rotor and the stator has to be stable and low – about 7 mm," said Puigcorbé.

According to Alstom, this air gap stability has been demonstrated at a range of power outputs, up to 6 MW, as well as at high wind speeds. Puigcorbé noted: "It has been demonstrated in winds that are very turbulent. This air gap stability demonstration as a result of Pure Torque has been one of the most important validations."

The first Haliade 150 prototype was installed onshore at Le Carnet in March 2012 and was commissioned until around July of that year. July through to December saw testing of the main components. This included testing the dynamics of the entire structure; main loads in the blades and tower; Pure Torque and air gap stability; control system verification; and testing of the individual main components such as the converter, generator and pitch and yaw system. Laboratory blade testing is still ongoing in Denmark.

The pitch and yaw system were of particular interest, since these have been improved. The pitch system, which is used to rotate the blades, uses improved batteries and actuator for greater reliability. According to Alstom, the new pitch system has performed better than expected.

Experience gained with its onshore turbines has also enabled Alstom to enhance the yaw system. "This is a less critical component than the pitch system but the results have been very good," said Puigcorbé.

With these validation tests completed by the end of 2012, official power curve measurements began in order to verify the main characteristics of the machine. The team is working on having full certification by the end of this year.

"This says that the machine meets the specified standards in terms of design, manufacturing and performance. It is the last step before we can

commercialise the product," said Puigcorbé.

Notably, last month (May) Alstom received certification of the power curve from an independent party. The power curve gives the power output as a function of wind speed and is perhaps the most important criterion for a turbine from a performance point of view.

Alstom says that achieving certification of the power curve means it will probably be the first in the market to offer a certified 6 MW machine with a large rotor.

The turbine at Le Carnet site has achieved around 1000 running hours. The Carnet site, located on the banks of the Loire estuary, was chosen for its geological characteristics, which are very similar to the submarine environment in which the wind turbines will be installed. The 25 m sub-structure (known as the 'jacket') was installed on pillars driven more than 30 m into the sea bed on which the 75 m high tower was then gradually mounted. In all, the nacelle rises more than 100 m above ground. The wind turbine and its support structure have a total combined weight of 1500 tons.

Le Carnet is actually described as a "near shore" site, where wind speeds

... there has been a very good correlation between the theoretical power curve and the actual measurements...

have been measured at up to 22 m/s. This means that the prototype has been tested under conditions that are similar to those at sea.

"In terms of corrosion, humidity and the kind of turbulence we can find at sea, it is quite similar. It is representative of the conditions we will find in the [offshore] wind farms in France," said Puigcorbé.

According to Alstom, there has been a very good correlation between the theoretical power curve and the actual measurements – with only a difference of 1 per cent between the designed theoretical power curve and the experimental field data.

Having proven the technology and equipment at Le Carnet, the next step is to test an identical turbine in the North Sea, off the Belgian coast. The offshore installation will permit testing of aspects of operation, maintenance and connection under real marine operating conditions.

Alstom and Belwind NV, the Belgian leader in offshore wind turbine energy production, have signed an agreement to install the Haliade 150 in the Bligh

Bank farm located 45 km off the Belgian coast, near the port of Ostend where it will be operated by Belwind under concession. The Haliade 150 will be connected to the electricity station of the first phase of the field.

Puigcorbé says the installation will help Alstom test aspects related to the diagnostics of the turbine when working in a remote location. "You have to improve all the diagnostics, sensing, scada data and control systems in order to allow remote operation of the machine. With regards to operation and maintenance, we will be able to assess the accessibility of the turbine, how it has to be maintained and what challenges we might face during maintenance out at sea."

Installation of this machine is expected to take place this month (June) and is perfectly timed to allow it to be a commercial offering for UK Round 3, ahead of the French wind farm orders that originally triggered the start of development.

Commenting on the French and UK programmes Frédéric Hendrick, Alstom Vice President of Offshore Wind, said: "For France, we have been awarded three of the four first round projects, which amounts to 1.4 GW."

The three projects located at Saint-Nazaire, Courseulles-sur-Mer and Fécamp, comprise around 240 wind turbines and represent a total of over €2 billion of orders for Alstom. Alstom is the exclusive supplier of these projects, which are being built by a consortium led by EDF Energies Nouvelles that also includes Dong Energy.

France originally set a target of 3 GW by 2020 in Round 1 and has so far awarded contracts to build 2.2 GW of offshore capacity. At the start of the year the government issued a second tender for Round 2, which will see the installation of two wind farms – one of 500 MW and another of 750 MW. It is expected that details of a third round will be published next year.

Meanwhile, in the UK progress has not been as fast as hoped. With ambitions to add 18 GW by 2020 only two projects are underway, despite planning consent being granted to several.

"For UK Round 3, things are not moving as fast as we would like, noted Hendrick. "This is due to the fact that some of the Round 2 projects were delayed – although it means we can

four factories to produce and assemble the wind turbines for the three offshore projects awarded by the French government.

Work has started on the two factories in the port areas of Saint-Nazaire (Loire Atlantique), where Alstom will manufacture nacelles and alternators. A pre-series production run has begun in Saint-Nazaire at a temporary facility that will manufacture pre-series units before the main factories come on stream. Construction of the factories in Cherbourg (Manche), which will produce blades and towers, is scheduled to begin around mid-2015.

"We do not want to start [building] four factories at the same time. Nacelles and generators are the priority since we have alternate sourcing for the blades and the towers," noted Hendrick.

These French manufacturing centres will be the first Alstom sites in the world entirely dedicated to offshore wind power and will permit the creation of 5000 permanent qualified jobs, including 1000 direct jobs (500 in Cherbourg, 300 in Saint-Nazaire, and 200 in an engineering centre located in Nantes).

In the meantime, Alstom continues to work closely with the likes of EDF and Dong. Having collaborated during the design and testing of the prototype, Alstom is sharing information with the companies on the performance data that will help in the design of the wind farms that will be located in France.

Puigcorbé said: "We are looking at things such as the optimum layout, the most suitable type of foundations, jackets and monopiles, electrical infrastructure etc. The collaboration is very close and transparent. We share a lot of data with EDF and Dong obviously because we have projects with them, but we have a similar approach with other clients."

As the turbine only represents 35 per cent of an offshore wind farm costs, this type of approach, says Alstom, is crucial. As Puigcorbé explained: "Sharing information on the characteristics of the turbine is important to optimise the foundations and electrical infrastructure at a particular site as they also contribute to lowering the cost of energy which, at the end of the day, has to be the main focus."

The power curve certification of the Haliade 150 heralds the imminent commercialisation of the new generation 6-7 MW offshore turbines with large rotors but looking to the future, Hendrick sees this as just the "start of the start".

He said: "We will probably be the first 6 MW large rotor machine to be certified on the market. These will be the new generation of turbines that will be used for the years to come. People may already be talking about 10 MW and above but at the end of the day, technically it does not make sense to have a 10 MW machine if you don't have the rotor size to go with it. At the moment the industry does not have the right solution for the very large rotors that would be required. Blade erosion, tip speeds, blade weight and how they would be installed etc., are all issues that would need to be addressed."

According to Alstom, some of these areas will require several years of work before the industry moves to that next 10+ MW generation. Further, the market will need to gain confidence in the new 6-7 MW machines and manufacturers' ability to deliver large, reliable offshore turbines.

Hendrick summarised: "Fortunately, we are very boring when it comes to the testing of our machine. Just over two years ago at the EWEA conference, we said what we are going to do and when we will do it. Two years later, we are exactly where we said we were going to be."



HALIADE™ 150-6MW



NEW GENERATION OFFSHORE WIND TURBINE

Robust : Alstom Pure Torque® technology

Simple : direct-drive permanent magnet generator (PMG)

Efficient : 150m diameter rotor for high energy yield

Survey surprises with confidence in growth



■ M&A outlook cautious ■ 1Q results disappoint

Sian Crampsie

Executives in the power and utilities sector have become more bullish over the last two years about global economic growth prospects and corporate earnings potential.

In a survey carried out by Ernst & Young, senior personnel indicated their confidence in improved economic stability, better credit availability and corporate earnings.

Ernst & Young said that the results were “surprising” and seemed at odds with the current low levels of merger and acquisition (M&A) activity in the power and utilities sector globally.

They also appear to contradict recent results and outlooks reported by utilities in Europe.

Enel, EnBW and Statkraft last month all reported falls in profits and said that the outlook for 2013 was bleak because of low wholesale electricity prices and overcapacity.

RWE reported a slight fall in operating

profit for the first quarter of 2013 but still managed to beat analysts’ expectations. The company said that the cold weather in early 2013 had helped to boost energy demand but that its electricity segment had disappointed.

According to Ernst & Young, expectations among power and utilities executives for global economic growth, corporate earning and credit availability “are at some of their highest levels in the last two years, with 83 per cent of global respondents anticipating economic growth, including 63 per cent citing growth of between 1 per cent and three per cent”.

The company’s survey results showed that more executives were confident about global economic growth than six months ago, while 52 per cent believe that credit availability is improving, compared to just 32 per cent in April.

It said that the power and utilities sector was being cautious about M&A deals because “global economic growth has been uneven and heavily supported

by monetary policy”.

Enel last month blamed the economic slump in Italy and Spain for its 26 per cent drop in first quarter net profit and said that electricity and natural gas demand in those two countries was unlikely to return to pre-crisis levels before 2017.

German giant E.On also painted a bleak outlook due to the muted energy demand and low power prices. CEO Johannes Teyssen told shareholders that the margins of its state-of-the-art gas fired power plants are “close to zero in many European markets”.

In May Statkraft said it had mothballed a gas power plant in Germany because of the low margins and stronger competition from coal. It has also sold its shares in E.On AG to raise money for investments and protect its credit rating.

Statkraft reported an 87 per cent fall in first quarter net profits. It has put the Robert Frank power plant in Germany in cold reserve.

Gamesa sets sights on Brazil

Gamesa says that it is planning to become one of the leading wind turbine makers in Brazil.

The Spanish firm has won accreditation from the Banco Nacional de Desenvolvimento Económico y Social (BNDES) under new rules for foreign companies operating in Brazil.

Compliance with the new rules is a prerequisite for qualifying for BNDES’s financing lines and they require suppliers of wind turbines to manufacture three key wind turbine components in Brazil.

The country is a priority market for Gamesa in the short to medium term. Gamesa started producing its equipment there in 2011 and has so far supplied over 900 MW to the market.

The firm says that Latin America as a whole accounted for 53 per cent of sales in the first quarter of 2013 and was its main growth driver, helping to offset declines in the US and Chinese market.

Initially BNDES’s rules require wind turbine manufacturers to make three

of the following parts in Brazil: tower, hub, blade and nacelle. The requirements will be tightened every six months until 2016 to increase the local content requirements.

Until January 2013, BNDES’s criteria had been financial, requiring 60 per cent of the total investment to be sourced in Brazil. Gamesa has a nacelle and hub assembly plant in Camaçari, Bahia state and is working with local suppliers on the manufacture of its towers and blades.

Gamesa returned to profit in the first quarter of 2013, with €7 million of attributable profit, compared with a loss of €19 million in the first quarter of 2012. “In a complex economic and industry situation, marked by falling demand and pressure on prices, Gamesa advanced with the commitments made in its business plan,” it said in a statement.

Revenues fell by 12.2 per cent over the first quarter of 2012 to €491 million while sales also fell by 12.2 per cent to 446 MWE.



Gamesa returned to profit in the first quarter of 2013

Companies create P2G alliance

The concept of power to gas (P2G) will play an important role in the future energy system, according to 11 European energy and technology companies that have joined forces to develop the technology.

P2G uses surplus renewable energy to produce gas that can then be stored or used in other areas of the energy sector. The North Sea Power to Gas Platform – whose members include DNV Kema, Fluxys Belgium, Hydrogenics and National Grid – aim to develop the concept and demonstrate its ability to reduce temporal surpluses of renewable energy.

The share of renewable energy in the European electricity mix is growing and it is increasingly hard for utilities to balance fluctuating levels of energy from solar and wind power plants.

At the same time, there are challenges to transmitting large volumes of renewable energy to consumers, while the natural gas network could accommodate large additional volumes of gas.

Using renewable energy to produce gas – which could then be used in

transportation, domestic heating, or as a chemical feedstock – therefore makes sense and would also help Europe to become carbon neutral by 2050, argues North Sea Power to Gas, whose members also include Energinet.dk, Maersk Oil, Alliander, Gasunie, TenneT, ITM Power and Open Grid Europe.

The P2G concept uses electrolysis and methanation, which combines carbon dioxide with hydrogen to produce a biogenous natural gas substitute.

P2G is of particular interest for the North Sea area as its on- and off-shore natural gas infrastructure is well developed. In addition, the combined generating capacity of offshore wind farms on the North Sea could reach around 100 GW by the year 2030, while the PV capacity installed in the countries surrounding the North Sea is expected to increase from 35 GW in 2012 to almost 60 GW in 2020.

“The establishment of the North Sea Power to Gas Platform is an important step in the transition towards a sustainable energy system”, said Lukas Grond, P2G expert at DNV Kema and secretary of the Platform.

Westinghouse SMR agreement targets China

Westinghouse Electric has strengthened its ties with China through two agreements with State Nuclear Power Technology Corp. (SNPTC).

The two companies have inked a memorandum of understanding to develop small modular reactor (SMR) technology, and have also created a joint venture to provide supplier qualification services to the global AP1000 nuclear power plant market.

In the SMR field, Westinghouse and SNPTC hope to develop a standard design plant, based on Westinghouse SMR technology, for licensing in both the USA and China. The deal is part of Westinghouse’s strategy to exploit opportunities around the world and would help to accelerate the deployment of SMRs.

“We are in the early stages of negotiations of an agreement that we expect will provide design, licensing, construction, and operational certainty that no other SMR supplier can match. We expect to be the first to market,” Westinghouse Senior Vice President and Chief Technology Officer Kate Jackson said.

Westinghouse says that the SNPTC partnership will draw on the

companies’ past and present joint efforts, including the deployment of the world’s first AP1000 nuclear power plants in China, for which SNPTC is the engineering, procurement and construction contractor.

This partnership has been extended with the new JV to qualify suppliers and develop the supply chain within China for AP1000 equipment and components. The JV will also work toward a goal of exporting equipment and components made by qualified

Chinese suppliers to global markets, and importing components and equipment made by qualified suppliers elsewhere in the world for use in China.

“We expect to provide new opportunities for business both within and outside of China,” said Westinghouse President and CEO Danny Roderick. “By forming this joint venture, we have a mechanism for delivering our goods and services together to a broader range of customers, delivering mutual business success.”



10 | Tenders, Bids & Contracts

Americas

ProInversion awards 70 MW contract

The Peruvian Private Investment Promotion Agency (ProInversion) has awarded the concession for the temporary supply of 70 MW of power to the city of Iquitos to Genrent do Brasil.

Genrent will supply a 70 MW thermal power plant to help Iquitos meet its energy needs until a new power transmission line is built. The project will cost \$100 million, said ProInversion.

Once Iquitos is connected to the national grid, the Genrent plant will serve as a backup power source.

Siemens awarded federal wind farm

The largest federal government wind farm in the USA is to be built by Siemens after the National Nuclear Security Administration (NNSA) awarded a contract to Siemens Government Technologies.

The Pantex wind farm will consist of five 2.3 MW wind turbines located on 1500 acres of government-owned land near Amarillo, TX. The facility will help the NNSA to meet government directives for energy use and renewables.

Siemens' contract includes a multi-year service, maintenance and warranty agreement.

Abengoa selected for transmission line project

Imperial Irrigation District (IID) has awarded Abengoa a contract to upgrade a 230 kV transmission line as well as several existing substations in California, USA.

The 'Path 42' project is part of a plan to extend the power network being developed by Imperial Irrigation District, the sixth largest electrical utility in California, in order to increase the capacity of the network and enable access to new sources of renewable energy in California.

The contract involves the reconductoring of a total of 32 km of a 230 kV transmission line, as well as the upgrade of existing substations, under a turnkey format. The project is expected to take 12 months to complete and will be delivered to Imperial Irrigation District in April 2014.

Ormat signs Wild Rose PPA

Ormat Technologies has secured a 20-year power purchase agreement (PPA) with the Southern California Public Power Authority (SCPPA) for the supply of electricity from the Wild Rose geothermal plant in Nevada.

The 16 MW Wild Rose plant is due to start operating at the end of 2013, when it will become the first renewable energy plant in Nevada to supply electricity to California via NV Energy's One Nevada transmission line.

Ormat will sell the power to SCPPA at \$99/MWh with no annual escalation. SCPPA will resell the power to the Los Angeles Department of Water and Power (LADWP) and Burbank Water and Power (BWP).

Asia-Pacific

BHEL awards Gadarwara contract

Bharat Heavy Electricals Limited (BHEL) has awarded Alstom a contract worth nearly €100 million to supply components and services for a new 2 x 800 MW power plant in Madhya Pradesh, India.

Alstom is to work with BHEL to design and supply pressure parts for

two supercritical boilers along with pulverisers and air preheater components. It will also assist BHEL with technical advisors during the erection and commissioning of the two units.

The Gadarwara power plant will start operating in 2016.

REC supplies Thai solar

REC is to deliver 72 MW of solar photovoltaic (PV) panels for the construction of six solar power plants in two provinces in Thailand.

The company has signed a deal with SolarCo to supply 293 040 Peak Energy Series solar panels that will be installed in Nakhon Pathom and Suphan Buri provinces. The projects will increase the number of REC's large scale installations in Thailand to seven.

The plants will be owned and operated by Yanhee EGCO Holding, while ItalThai Engineering Co., Ltd. and Phoenix Solar Pte Ltd. will share engineering, procurement and construction responsibilities.

Tehri Hydro opts for variable speed technology

Tehri Hydro Development Corporation has selected GE's variable speed drive technology for a new 1000 MW pumped storage hydropower plant being developed in Uttarakhand, northern India.

The new power plant on the Bhagirathi River will be the first pumped storage hydro plant in India to use variable speed pump turbine sets, which will help to improve grid stability in the region.

GE's Power Conversion drive systems will be used for all of the plant's variable-speed motor/generator sets of the pump turbines to enable continuous control of the plant's pump output.

Europe

Dungeness B upgrades control systems

EDF Energy has selected ABB to engineer improvements to the steam turbine governors of the 1040 MW Dungeness B nuclear power plant in the UK.

The improvements will be made to the governors for the main turbine and the main boiler feed pump turbine of Units 1 and 2 at the plant, which was commissioned in 1983. ABB will also carry out upgrades to the control interface and event logger.

The upgrade to the control system is part of EDF Energy's ongoing programme of upgrades to improve performance and replace major components with more efficient modern designs.

ABB's engineering team will work closely with EDF Energy staff to design the new equipment and interface it with the station's existing ABB Procontrol P13 distributed control system.

The project is due to be completed in the summer of 2013.

Nordex to build Ireland's largest wind farm

Nordex has started the construction of the 87.5 MW Knockacummer wind farm in County Cork, Ireland.

The wind farm is owned by Irish utility Bord Gáis Eireann and will consist of 35 N90/2500 wind turbines. Nordex will build and commission the wind farm as well as carry out servicing for 15 years.

Construction of the foundations and access routes started in April 2013 and first turbines are expected to be shipped to the site in September 2013.

Bord Gáis Eireann is Ireland's largest

natural gas utility and is currently operating wind farms with a total installed capacity of over 200 MW. Knockacummer is the fourth and largest project to be executed by the two companies.

On completion of Knockacummer, Bord Gáis Eireann will be operating Nordex wind turbines with a total capacity of 185 MW. Nordex installed its first turbine in Ireland in 2002.

Alstom to renovate Kaprun Hauptstufe

Verbund Hydro Power AG has placed an order with Alstom for the renovation of two generators in the Kaprun Hauptstufe hydropower plant in Austria.

The project will extend the service life and increase the output of the plant's M3 and M4 generators. Commissioning is scheduled for April 2016.

The two generators in Hauptstufe Kaprun have a rated power output of 100 MVA each. Currently, the maximum power output of the power plant is 240 MW but the renovation will increase this to 270 MW.

SgurrEnergy selected for tidal lagoon

International renewable energy consultancy, SgurrEnergy, part of Wood Group, has been elected as strategic advisor to the Swansea Bay Tidal Lagoon project, the world's first, purpose built tidal lagoon power plant.

SgurrEnergy has been appointed by developer, Tidal Lagoon Power Limited (TLP), to provide technical support to the proposed £650 million lagoon power plant, to be based in Wales.

The Glasgow-based company has provided a range of technical services and strategic support to TLP. A key focus has been to support a thorough understanding of the project's technical and commercial risk profile, helping TLP to construct a well-informed project development strategy aligned with achieving its required investment potential.

Advice has been given by SgurrEnergy on electricity generation design and technology, construction methodology and contract and technical documentation to help support the project through to financial close and ensure its bankability.

The Swansea Bay Tidal Lagoon project will have a total installed capacity of 250 MW, with a potential annual output of 400 GWh. It is expected that the project will reach financial close by the end of 2013, with construction commencing in April 2014.

Veidekke to build Berlevag wind farm

Veidekke Entreprenor AS has been commissioned by Varanger Kraft to build infrastructure, foundations and a transformer building for the Raggovidda wind farm in Finnmark, northern Norway.

Veidekke will design and build infrastructure for the facility, which includes a 9 km access road to the wind farm, about 12 km of internal roads, parking spaces, cable trenches and foundations for 15 wind turbines. In addition, Veidekke will build a transformer building approximately 300 m² in size.

The 45 MW wind farm will be commissioned in late 2014.

International

Siemens wins SA wind order

Siemens Energy has been awarded an onshore wind power order for the Sere wind power plant on the west coast of South Africa.

The Sere wind farm is one of Eskom's flagship energy projects and marks the second order for wind turbines from South Africa for Siemens. The 105 MW project is scheduled to be commissioned in 2014.

Siemens' scope of supply includes the delivery and installation of 46 wind turbines of the type SWT-2.3-108. The contract also includes a five-year service agreement.

The first wind power order from South Africa was awarded to Siemens by Mainstream Renewable Power Limited, Globeleq, and local B-BBEE investors Thebe Investments, Enzani and Usizo for the Jeffrey's Bay onshore wind power plant with a total capacity of 138 MW.

Wärtsilä signs Zambia agreement

Wärtsilä has signed a service agreement for a power plant in Zambia.

The Finnish firm signed a ten-year operations and maintenance agreement with Ndola Energy Company Limited (NECL), a subsidiary of Great Lakes Energy NV, for the 50 MW NECL power plant in Ndola, Zambia.

The plant will be powered by a total of six Wärtsilä 32 engines running on heavy fuel oil (HFO), a byproduct supplied from the Indeni refinery, which is immediately adjacent to the plant. The plant is scheduled to commence commercial operations at the end of July 2013, and the electricity produced will be sold to Zambia Electricity Supply Company Ltd (ZESCO Ltd).

The NECL power plant will contribute towards Zambia achieving a more diversified energy mix and increased stability in its power generation. The country relies heavily on hydropower and this new power plant will complement Zambia's installed capacity.

GE powers green waste projects

Green Waste Energy (GWE) has signed a framework agreement with GE for the supply of Jenbacher gas engines to power a series of recycling and energy conversion plants that it plans to build around the world.

GE is to provide GWE subsidiary Green Waste Energy Development (GWED) with Jenbacher J620 gas engines that will run on syngas produced at the proposed waste-to-energy plants.

GWED uses a proprietary non-burn advanced pyrolysis technology from C6 Technologies to convert waste into syngas that can then be used to generate electricity or produce transportation fuels. It is planning waste-to-energy projects in the USA, UK, Africa and Asia.

The first project will be located in Theddington, UK, where GWED and J. M. Clarke & Sons will build a waste-to-energy facility equipped with six J620 gas engines.

SEC issues €200 million worth of contracts

Saudi Electricity Company (SEC) has awarded two contracts valued at approximately €200 million to Siemens Energy. The first contract includes the supply of five SGT6-2000E gas turbines, which will add 388 MW to the Rafha, Qurayyat and Arar areas.

The second order is for a turnkey project to build the Al-Kharj 2 380 kV substation. Under the contract, Siemens will supply all key components such as gas insulated switchgear, transformers, line reactors, switchgear, protection systems, telecommunication systems, and will also provide civil engineering and substation building. The substation will enhance the reliability and security of power supply, while addressing the growing demand for electricity in the Al-Kharj region.



Oil

US crude is a global “game changer”

- Opec to face challenges in years ahead
- US crude oil production highest in 21 years

David Gregory

Crude oil prices settled into a comfortable range during the first half of May, with West Texas Intermediate (WTI) moving in the mid-\$90/b range and Brent at around \$100-104/b. The Opec basket slipped below \$100/b in the first days of the month and then again on May 15, but soon bounced back above \$100/b where Opec members consider the price to be fair for consumers and producers.

In its latest *Monthly Oil Market Report*, Opec estimated that demand for its crude averaged 30.2 million b/d during 2012 and forecast that the call on its production would be 29.8 million b/d in 2013. Non-Opec crude supply is expected to rise by 980 000 b/d this year to 53.96 million b/d compared to 52.98 million b/d in 2012. Opec forecast total global demand at 89.66 million b/d for this year, up from

88.87 billion bpd in 2012.

Opec has long been regarded as the maker or breaker of world oil markets, but in the International Energy Agency's (IEA) latest annual Medium-Term Oil Market Report, released in mid-May and which looks at the next five years, the Paris-based agency said the global market will “undergo sweeping changes” during the next five years due to the “ongoing hydrocarbon revolution in North America.”

The IEA said the advent of shale gas in the US and Canada would be a game changer for global markets. The agency forecast that non-Opec supply will rise by 5.96 million b/d, to average 59.31 million b/d in 2018 compared to 53.35 million b/d in 2012.

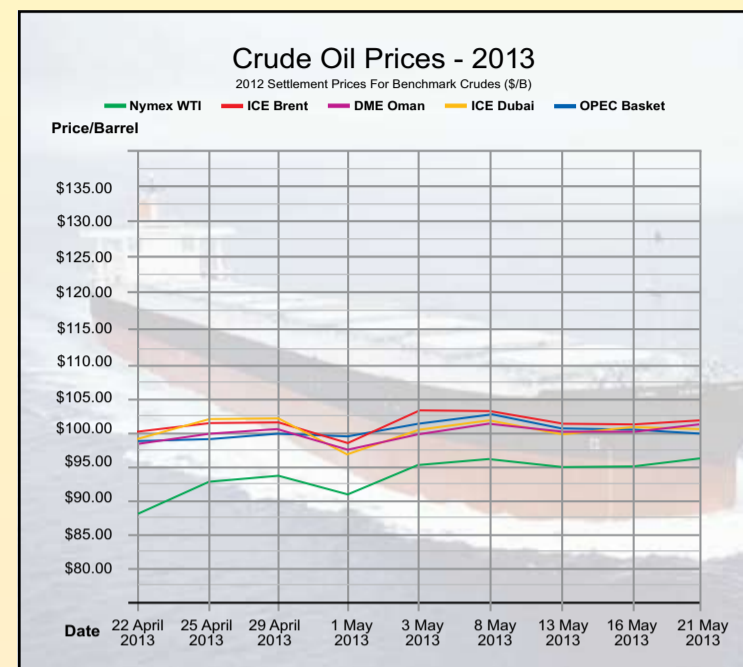
It said US crude production will rise by 2.3 million b/d over the next five years, accounting for more of the 3.9 million b/d increase from North America during that time. US crude output is forecast to rise to 11.92

million b/d by 2018.

The IEA forecast that global demand in 2018 will average 96.98 million b/d. US demand will average 18.2 million b/d and China is forecast to consume almost 12 million b/d in that year.

When introducing the medium term report, IEA Executive Director Maria van der Hoeven said there are many factors that will compound the impact of this new American supply. “Crude quality, infrastructure requirements, current regulations, and the potential for replication elsewhere, to name a few,” she said. “And the technologies which drive the boom will increase production from more mature fields, shifting some investment from more risky ‘frontier’ regions. Altogether, these factors are forcing a series of chain reactions that will leave very few links in the global oil supply chain unaffected,” she said.

By contrast, Opec is expected to face



a number of challenges in the years ahead. Demand for its crude is seen as remaining below 30 million b/d until 2018, when the call on Opec crude will rise to 30.37 million b/d. Production capacity within Opec is also expected to rise at a slower pace than had been previously anticipated. In 2018, the group's capacity is expected to be 36.75 million b/d.

The IEA director pointed out that Opec crude would continue to be “essential” on global markets, but in the medium term, the group would face new challenges. “Security risks are on the rise in North and sub-Saharan Africa, and political uncertainty in North Africa and the Middle East can carry heavy consequences for the oil market,” van der Hoeven said. “Both are expected to negatively impact production growth in those areas,” she added.

Most of these challenges are due to the ongoing impact of the Arab Spring, the medium term report said, stating that it is taking a toll on investment and capacity growth.

“Increased violence by Islamist extremists and militants, combined with political instability across much of North and West Africa since the start of the Arab Spring in 2011, is changing the equation for acceptable risks for international oil companies,” the report said. “Project delays are already apparent in Algeria, Libya and Nigeria,” it added.

Meanwhile, the American Petroleum Institute (API) said in a report on May 23 that US crude oil production reached its highest level in 21 years during April. It said production in the lower 48 states was the highest it had been in 27 years.

Gas

US takes serious step towards LNG exports

The decision to approve the application of Freeport LNG to export liquefied natural gas may mark the start of a significant effort by the US to become a major global gas exporter.

Mark Goetz

The US Department of Energy's recent decision to approve the application of Freeport LNG to export natural gas in the form of LNG signals the start of a new era for international gas markets. Freeport LNG is the second US company to receive DoE approval to export LNG to countries that do not have a Free Trade Agreement (FTA) with the US.

Cheniere Energy won DoE approval in 2011 and is planning to start exports from its Sabine Pass facility in Cameron Parish, Louisiana, in 2015-16. Freeport LNG is expected to make a final investment decision for its terminal on Quintana Island, Texas, later this year, which could allow it to begin exports in 2017.

There are a further 19 companies with applications pending at the DoE

to export LNG, and while not all are expected to receive export approval, the number of firms keen to get into the gas export business is an indication of the impact that the shale gas boom has had on the US market, where natural gas prices are around \$4 per million Btu. As a knock-on, US shale gas is expected to affect world gas players.

The Australian newspaper reported last month that Freeport LNG exports to Japan – to Chubu Electric and Osaka Gas – are likely to be worth \$10 per million Btu, substantially less than the \$16-17 per million Btu that Japan will pay Qatar and Australia under oil-linked contracts.

Australia, with huge LNG projects operating and under way in the country's northwest offshore, is seen as eventually overtaking Qatar as the world's largest LNG producer with 77 million tons/year. Now it looks like the US could within the decade

become a major LNG exporter itself.

The DoE on May 17 announced that subject to environmental review and final regulatory approval, the Freeport LNG facility is authorised to export gas at a rate of 1.4 billion cubic feet per day (cfed) for a period of 20 years. That is 511 billion cubic feet per year, or up to 10 million tons per year of LNG.

Cheniere Energy has approval to export gas at a rate of 2.2 billion cubic feet per day, or 16 million tons per year.

“The development of US natural gas resources is having a transformative impact on the US energy landscape, helping to improve our energy security while spurring economic development and job creation around the country,” the DoE said in a statement announcing approval of the Freeport LNG application. “This increase in domestic natural gas production is expected to

continue,” it added.

The DoE's Energy Information Administration has forecast that the US will this year produce natural gas at a rate of 69.3 billion cfd, or a total of 708 billion cubic metres.

Late last year the DoE released a commissioned study on the impact that LNG exports would have on the US economy. The study, carried out by NERA Economic Consulting, showed that gas exports would have a positive impact on the US economy.

But there are some business interests in the US that argue against large-scale export, such as Dow Chemical, which wants to keep natural gas prices low and argue that restricting gas exports will boost US manufacturing with a cheap raw material. However, there is also the argument that exports will encourage more shale gas production.

The DoE said it would proceed with reviewing the remaining applications

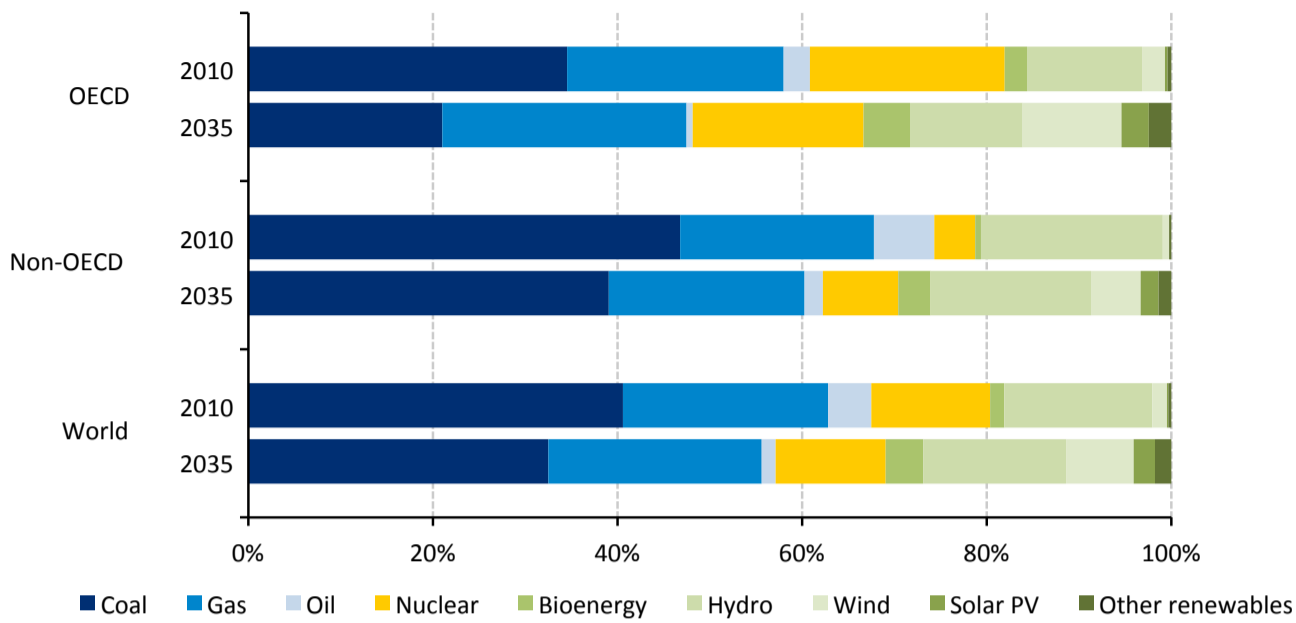
for LNG export approval to non-FTA countries on a case-by-case basis, in the order in which the companies applied. Next in line will be Lake Charles LNG project, which will be able to produce 15 million tons per year, the Cove Point LNG project in Maryland with a 5.25 million tons per year capacity, and the Cameron LNG project in Louisiana with a 12 million tons per year capacity, energy market sources have reported.

In a statement announcing that it had received DoE approval for its project, Freeport LNG said the “overwhelming evidence in favour of LNG exports generated during the DoE's two-and-a-half year review, definitely confirms that the DOE should act swiftly to approve additional pending LNG export applications.”

The American Petroleum Institute (API) also called for the remaining applications to be approved swiftly.

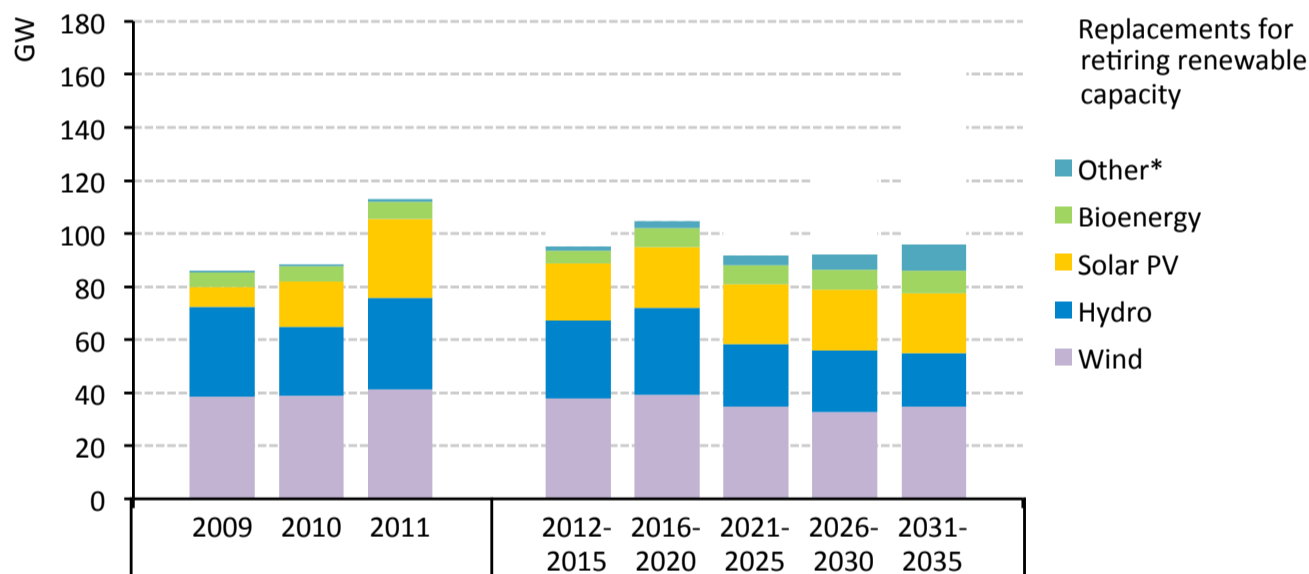
12 | Energy Industry Data

Share of electricity generation by fuel and region in the New Policies Scenario



World Energy Outlook 2012 © OECD/IEA 2012, Figure 6.2, page 183

World average annual renewables-based generation net capacity additions by technology



*Other includes geothermal, concentrating solar power and marine

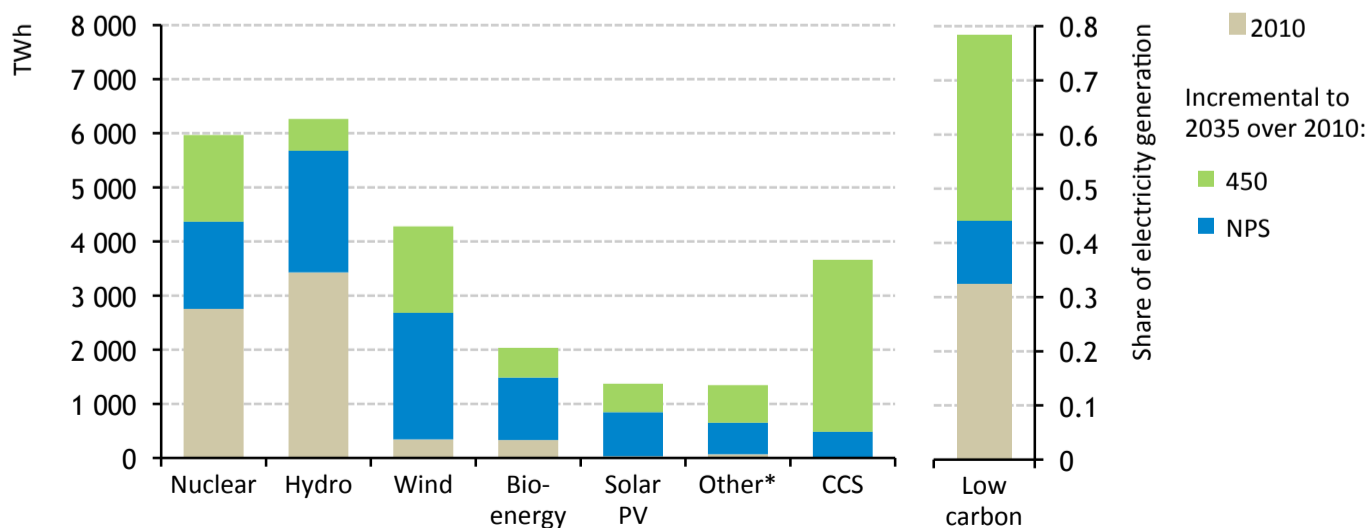
World Energy Outlook 2012 © OECD/IEA 2012, Figure 7.2, page 217

For more information, please contact:

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

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

Electricity generation by selected low carbon technology & share of electricity generation



*Other includes geothermal, concentrating solar power and marine

World Energy Outlook 2012 © OECD/IEA 2012, Figure 8.6, page 250

This section is supported by ABB

Power and productivity
for a better world™ **ABB**

Nature's calling

The European wind industry has a new voice in Thomas Becker, the recently appointed CEO of the European Wind Energy Association. **Junior Isles** speaks to this hunter looking for new game.

As a keen hunter with an affection for old Mercedes classics, Thomas Becker might not seem the obvious replacement for Christian Kjaer as the new CEO of the European Wind Energy Association (EWEA). Yet if you dig a bit deeper, it soon becomes clear why a man with such interests can also be passionate about wind turbines.

For Becker, hunting is now more about getting out and being at one with nature, not shooting deer. "These days I hunt smaller animals, mostly birds and hares."

Age has also seen him develop a particular taste for classic cars. "I have my garage and garden full of old Mercedes cars that I repair. They are not environmentally friendly at all because they have enormous, polluting engines. But we are all human beings," he concedes.

Such open honesty and the acceptance of the reality of a situation should serve Becker well in his new position, which he officially started on April 1, 2013. Indeed a fascination with the look and workings of machinery like old Mercedes classics probably played a part in Becker's attraction to EWEA and the wind industry.

"I have always liked the aesthetics of wind turbines," he says. "Also, from the time of Aristotle, mankind has been fascinated by the thought of a machine that runs for eternity, like perpetual motion. Of course they need maintenance but I think wind turbines are the closest you get to a machine that runs forever with no fuel."

Just prior to joining EWEA, Becker was CEO for three years at Genan – a Danish company that recycles used

is to make the car less damaging to the environment. It has to be the same for the use of energy and electricity."

Becker says it is not just about the environmental consequences of the continuing use of fossil fuels. He also points out that wind solves several problems.

"Wind provides energy independence. The EU is a huge net importer of fossil fuels. Also, it is simply bad housekeeping to send all of that money out of the EU. We could easily use that money for our own purposes instead of sending it to these, sometimes, dubious regimes.

"Importing fossil fuels does not create jobs in Europe; it does not create R&D or any engineering activity, and it's not permanent. You consume it and it's gone. With wind turbines, after the upfront costs, it's completely reliable and remains there. Plus, you know what your cost is for a long time – one of the worst things for any industry is price volatility."

Wind could potentially address many of the EU's sometimes conflicting goals. But there are those who argue that the cost of wind, like solar and other forms of renewable generation, is high and cannot survive without subsidies.

It is an argument that Becker strongly refutes. He says that wind is now "definitely competitive with nuclear and coal" and will soon be with gas. One of the three main priorities for EWEA is therefore to "puncture the myth" that wind can only survive when it is highly subsidised, whereas fossil fired and nuclear generation are not supported.

He stressed: "Unfortunately the fossil fuel lobby has managed to create this myth, which is false. If you were

"The wind industry has to be less of an excuse for itself; it has to take its proper place in the landscape of big, growing industries in Europe"

tyres on a very large scale globally. Before this he had a long history as a civil servant.

A lawyer by education, Becker has worked as a civil servant for about 25 years in energy, foreign affairs and environment. He was Deputy Permanent Secretary at the Danish Ministry of Climate and Energy and also worked for the Danish Ministry of the Environment, as well as for the Danish Environment Protection Agency. During his time as a civil servant, Becker also worked on various environmental impact assessments projects for private companies in various parts of the world.

Such extensive experience with environmental issues helps Becker to keep it real. "People might say that the answer to climate change is to use less energy but unfortunately, I think that's a no-go. It's a political reality. It's the same as saying that people should stop driving cars; it won't happen. So the answer

to internalise the externalities of fossil fuels, the price would be much higher. International Energy Agency calculations show that fossil fuel energy is highly subsidised. Their figures, not ours, show that it is subsidised to the tune of \$110 for every tonne of CO₂ emitted."

Becker went on: "Investors will not build a nuclear power plant without having the security from the state that the electricity from the plant will be sold. If that is not a subsidy, I don't know what is. Yet when the wind industry is guaranteed a certain price, everyone says it is subsidised. This is something we have to counter every time it happens.

"We have to expose the subsidies that go to other types of industry in general. All big infrastructure development projects in Europe are, in one way or another, a political wish and are therefore given incentives. That's how you do industrial politics."

Another, and possibly the main priority for EWEA and the EU wind sector is the development of a more extensive European grid so that wind resources across the entire region can be harnessed and transmitted to where it is needed. "This," says Becker, "will not only benefit wind but all forms of generation. It is a very, very important factor when it



Becker: Wind provides energy independence

comes to stabilising the economy of wind."

The other key priority for EWEA is to lobby the EU into adopting an ambitious combined renewable energy and CO₂ target for 2030. "This is very important to create the necessary security that investors need."

Becker does not underestimate the obstacles in an environment that has gone from being "very positive" towards wind, to one that that is "quite difficult". Yet he remains confident. He notes: "The dinosaurs of the fossil fuel and nuclear industries are very efficient lobbyists. Although we may have a slight downturn, renewables and wind will prevail in the future."

However, Becker is aware that the past is no guarantee of the future. Wind has become a "real industry" over the years, creating significant employment. Yet despite being big business, Becker believes the industry can do a lot more in terms of presenting itself against the traditional forms of generation.

"There is a tendency that the wind industry itself does not present itself as a proper industry. This is something I am going to try to work on. The wind industry has to be less of an excuse for itself; it has to take its proper place in the landscape of big, growing industries in Europe," said Becker.

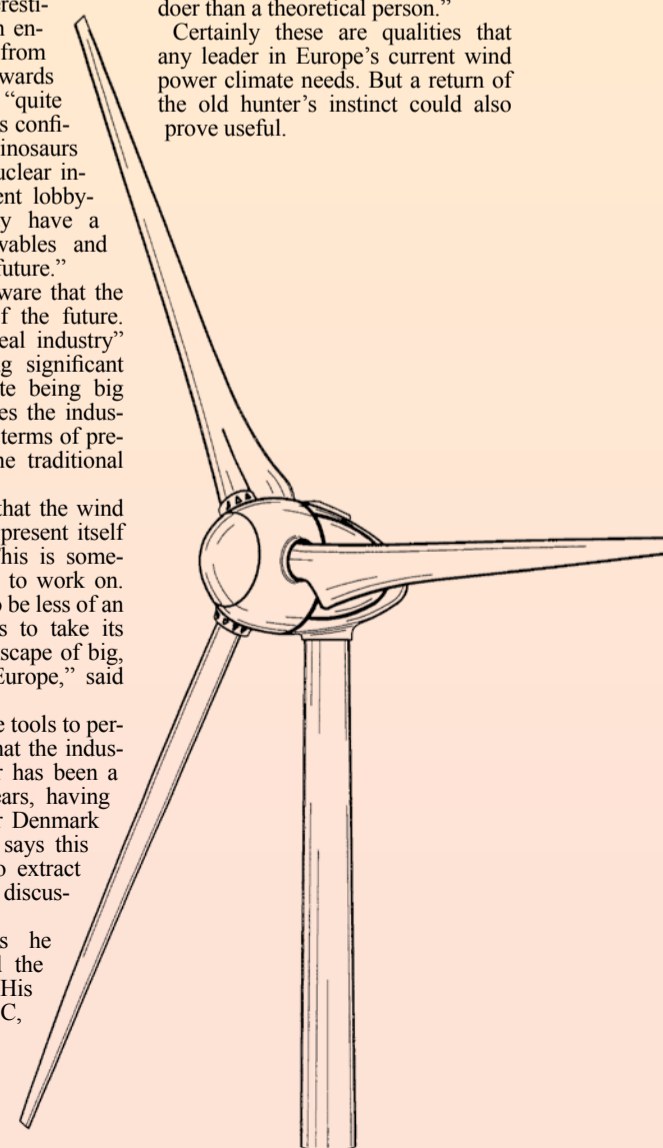
He appears to have the tools to persuade key people on what the industry needs to do. Becker has been a negotiator for many years, having been lead negotiator for Denmark on climate change. He says this gives him the ability to extract important points from discussion and react quickly.

Becker also believes he knows his way around the corridors of Brussels. His work with the UNFCCC,

gave him the opportunity to gain inside knowledge of the machinations of the EU. "Knowing the internal workings of the EU is more or less a science in itself," he joked.

By his own admission, Becker is an outspoken individual. "I'm sometimes too outspoken and more of a doer than a theoretical person."

Certainly these are qualities that any leader in Europe's current wind power climate needs. But a return of the old hunter's instinct could also prove useful.



Big hopes for small packages

Against a changing energy landscape, the US Department of Energy sees significant market opportunities for small modular reactors and is putting its weight behind the development of the technology.

Junior Isles

With global carbon dioxide emissions recently hitting 400 ppm, the highest level in 3-5 million years, some argue that nuclear energy has to be part of the future power generation mix if mankind is to reduce its carbon footprint.

However, the nuclear power industry has long been beset by challenges that have been exacerbated by the accident at the Fukushima Daiichi nuclear power plant in Japan just over two years ago. Plant construction times of 10 years are not untypical, when taking permitting and licensing into account. They also carry a high price tag. The latest 1600 MW EPR being proposed for Hinkley Point C in the UK, for example, is expected to cost about £14 billion.

The drive to develop small modular nuclear reactors (SMRs) that can be built in half the time and with lower costs and associated project risks has therefore been gaining momentum.

In April, the development of SMRs received a significant boost when Babcock and Wilcox, the parent company of Generation mPower, received funding from the US Department of Energy to support the commercialisation of its SMR.

Commenting on the state of the nuclear industry and the need for SMRs, Chris Mowry, CEO of Generation mPower said: "Once a nuclear plant is built, the running costs are much lower than other baseload plants. However, the total magnitude of the investment for a single [nuclear] power plant and the risk profile of the investment in the project also need to be reasonable. It's hard to find private financing in deregulated markets like the UK and the US for these huge nuclear mega projects, which continue to suffer from the risks associated with size and complexity."

He added: "Even in some developing countries that have access to the needed capital, large nuclear is not a viable solution. Unless you have extremely concentrated loads, as you do on the coast of China, or a very robust grid, you don't really need 1500 MW of power coming out of a single plant. These are the issues that SMRs are trying to address. It's not so much a technology issue as a risk issue, as well as a more incremental approach to generation."

Mowry sees 200-300 MWe as a good size for adding power incrementally to match load growth or replace retired capacity and mPower has therefore been developing a SMR to deliver power at the lower end of this size range.

In April the company received a boost when it signed a Cooperative

Agreement with the US Department of Energy (DOE) that immediately provides it with \$79 million from the DOE's SMR Licensing Technical Support Programme. The money has been allocated for the first year of engineering design work and licensing of mPower's technology. The DOE has projected that approximately \$150 million will be made available during the five-year period of the DOE award.

Having secured this funding, the next milestone for mPower will be the submission of the design to the US Nuclear Regulatory Commission for approval by the end of this year. With the approval process expected to take several years and construction in the region of three years, the first plant will be in commercial operation by the end of 2021. This first plant will be located at the Clinch River site owned by Tennessee Valley Authority.

According to Matthew Crozat, a Senior Policy Advisor in the Office of Nuclear Energy at the DOE, mPower's technology was selected from several competing bids on the basis of its ability to be licensed and deployed within the 2022 timeframe specified for the competition.

Unlike some countries, which turned away from nuclear after Fukushima, the US still sees a central role for nuclear in its future energy mix. However, the US government's decision to support SMR technology is being driven by the shifting domestic energy landscape.

Crozat explained: "A few years ago, just before the enthusiasm for a nuclear renaissance, there was the expectation that there would be a change in the policy regarding how we do energy in the US. Also, pretty stable demand growth was expected for the coming decades."

"Now things have changed – there has not as yet been the expected change on the price of carbon and load growth projections have been significantly dampened. Natural gas prices have also provided an obvious short-term alternative for utilities. With regards to the overall nuclear perspective, this has seen a shift in where investors are looking, and SMRs are part of this."

Considering the target of reducing carbon emissions by 80 per cent by 2050, Crozat believes there is room for both large and small nuclear plants in the US. "Large plants are suited to the southeast where there is high population and energy growth and it's easy to forecast demand. The smaller ones have a lot of market potential, especially where utilities see more risk in their portfolio. Rather than



Mowry: SMRs are moving from a concept stage to a phase where people can start thinking about placing orders

having to spend \$10 billion to get clean baseload generation in your portfolio, it's more like \$2 billion. That's an easier financing and planning horizon for many utilities."

Crozat also sees a great deal of interest in SMRs in other parts of the world. "As we talk to a lot of countries, one of the things they always want to talk about is SMRs."

Certainly SMRs could prove attractive in developed countries in the west that are looking to lower their CO₂ footprint without spending the billions of dollars needed for a large nuclear plant.

Mowry noted: "Outside of the US we have seen interest in Canada and very strong interest in the UK."

In light of Fukushima, the increased safety aspects of SMRs could also see them become popular in Japan and other markets in Asia. "In China, there is a huge demand for nuclear in the interior [of the country]. To access that market, you need to have plants that are even safer than the ones being built today. So, there are large market opportunities there," said Mowry. He also believes that the Middle East, which is looking to nuclear to be part of a future energy mix that allows it to preserve its oil reserves for export, offers big opportunities.

The continued funding of mPower's and other SMR designs is critical if the technology is to exploit the market opportunities in the US and elsewhere. The DOE has therefore launched a second competition that could see additional funding be made available to another SMR design. Proposals are expected by July 1 so that a selection can be made in September and the final

award given by the start of 2014.

The criterion for this second competition is less focused on deployment by 2022. Crozat said: "The timeframe has been pushed out a bit to emphasise innovation, especially on safety and other characteristics. The first solicitation required the SMR development project to have a utility partner that could work through the utility licensing. This time we are looking to get the state-of-the-art in terms of what's possible for the designs themselves."

Funding will come from the original \$452 million that is available for both competitions over the six-year programme.

Mowry stressed the importance of continued DOE support for SMR development. "Funding is absolutely essential," he said. "As far I know, there has never been any reasonably sized nuclear plant designed anywhere in the world without some level of governmental support. This is largely because nuclear is wrapped up in national policy matters. The support we are receiving is less than has historically been given but it sharpens the focus – of us, and the industry. But to allow the development to continue at a pace to allow a payback in a reasonable amount of time, it's absolutely necessary."

"Global interest in SMR technology seems to be accelerating and the fact that the DOE is throwing its funding and weight behind it adds further credibility. It's now moving from a concept stage to a phase where people can really start thinking about placing orders. The energy industry wants nuclear but is searching for an acceptable risk profile. SMRs really offer that promise."

Generation mPower's scalable SMR

Generation mPower's SMR is a scalable, modular, advanced light water reactor (ALWR) system in which the nuclear core and steam generators are contained within a single vessel. The company believes this optimised ALWR Generation III++ nuclear technology can be certified, manufactured and operated within today's existing regulatory, industrial supply chain and utility operational infrastructure.

The plant has a nominal power output of 180 MWe increments and can operate for four years without refuelling, using standard pressurised water reactor (PWR) fuel.

The use of Generation III++ technology means the reactor has a number of important safety systems. It has an integral nuclear system design that incorporates lessons learned from existing nuclear reactor fleet: passive safety systems are not dependent on external electrical power; the four-year operating cycle between refuelling contributes to improved nuclear material security; and less than five per cent enriched fuel is industry standard. Further, secure underground containment reduces consequences of aircraft impact or natural disasters.

The reactor's air-cooled condenser, underground containment and small site footprint also all help to minimise environmental impact.



Technology

The answer is in the air

Highview's 300 kW pilot plant in Slough, UK

Liquid air technology has the potential to provide utility scale energy storage and efficiently turn waste heat into power.

Junior Isles looks at this technology, which could have a tremendous impact on the energy sector.

Balancing supply and demand in grids that are having to accommodate an increasing amount of intermittent renewable generation, such as wind and solar, is one of the major technical challenges facing today's power sector.

In Spain, for example, between November and February wind farms produced more electricity than any other power source for the first time ever. Although the increasing amount of wind on the grid is good news for decarbonisation efforts, such high wind penetration presents two main challenges: how to generate sufficient electricity when wind output is low or zero; and how to absorb excess generation when wind output is high and demand is low.

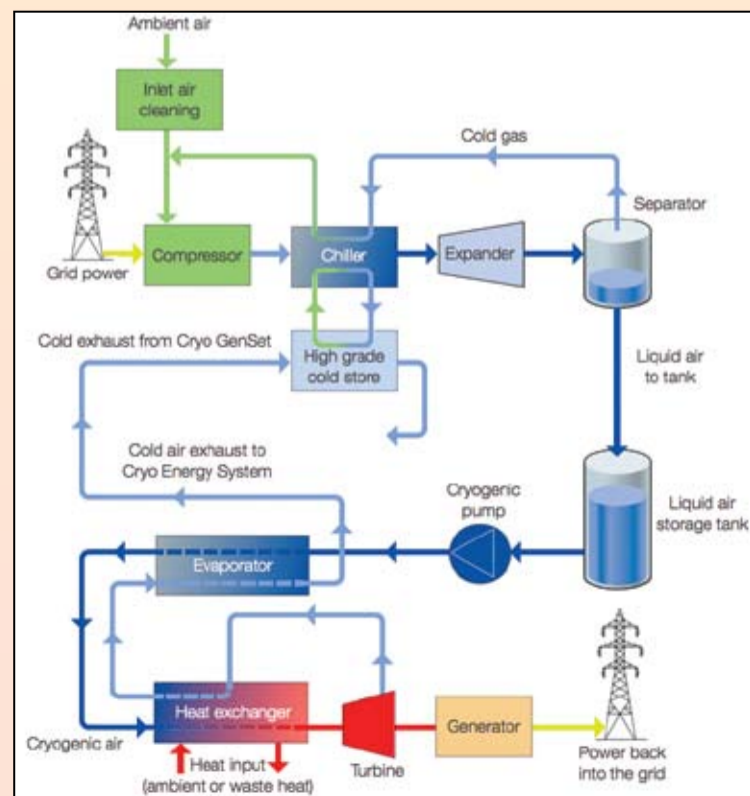
While using gas turbine or reciprocating engine-based peaking plants can tackle the first problem, the second requires a new approach. The use of liquid air as an 'energy vector' has the potential to address both issues.

The term energy vector is used to describe the method of transporting energy from one location to another and from one point in time to another. Hydrogen and the 'hydrogen economy', for example, has been a much talked about energy vector. However, its use faces a number of technical and economic challenges that look unlikely to be solved any time soon.

Fairly recent technology breakthroughs make liquid air seem a more viable energy vector, one that can be deployed in the near to mid-term.

As a UK innovation, development of the technology is being supported by the Centre for Low Carbon Futures (CLCF) within the scope of its programme on energy storage.

The cryoenergy system can use waste cold at the front-end of the process when liquefying the air and waste heat at the back-end of the process



A recent report published by the CLFC entitled 'Liquid Air in the energy and transport systems' provides details of the technology and the opportunities for industry and innovation in the UK.

Although there have been numerous attempts over the last century to exploit liquid air, a significant breakthrough came in 2001, when the British inventor Peter Dearman developed and patented the Dearman Engine.

The key to Dearman's breakthrough was the realisation that liquid air could be vaporised inside an engine cylinder using heat supplied by a thermal fluid mixture such as water and glycol, eliminating the need for the bulky and inefficient external heat exchangers of traditional cryogenic engines.

It was not until 2006, however, that the possibilities for Dearman's technology in the power sector began to take shape when UK-based Highview Power Storage began to develop the Dearman Engine technology. Working with the University of Leeds, Highview developed a series of efficiency enhancements to the liquid air cycle by integrating the production and expansion processes to make use of waste heat and cold, so making the concept of a grid scale energy storage system economically viable.

With a working pilot operating successfully in Slough, Highview is now proposing two demonstration projects that will use the technology for power generation in a commercial setting.

The first would see Highview working with National Grid and UK-engineering company Costain to build the UK's first grid scale liquid air energy storage plant at National Grid's Grain Liquefied Natural Gas (LNG) import terminal on the Isle of Grain in Kent.

For the second project Viridor, one of the UK's leading recycling and waste management companies, would host a 'cryogenet' alongside a landfill-gas power generation plant in Canterbury.

Both projects have been proposed under an energy storage demonstration competition being run by the Department of Energy and Climate Change (DECC). The two projects are already on a shortlist of projects that will receive some funding from DECC to allow detailed design work to be completed. Full funding – which would cover 100 per cent of the winning project(s) cost – is expected to be awarded towards the end of this month (June).

Commenting on the National Grid project, Gareth Brett, CEO, Highview says there are two main reasons why their technology fits well with National Grid's Grain facility.

"An advantage of our system is that we can use waste thermal streams at either end of the process – we can use waste cold at the front end of the process when we are liquefying the air and we can use waste heat at the back-end of the process when we are boiling the liquid air, ready for



Brett: the system provides pumped storage hydro capability where the demand is

expansion in the turbine. At Grain, we have access to heat and cold. When the LNG is being evaporated from less than -160°C back to ambient temperature, there's a lot of excess waste cold that we can use in a liquid air refrigeration process. This reduces the amount of power we need to refrigerate the air in the first place, which enhances the overall efficiency of the system," he said.

Grain also has a large electrical demand that fluctuates. "National Grid cannot wait until the price of electricity is low to unload tankers as they come in. By having [electricity] storage on site we can manipulate their overall electricity demand curve to help save them money in operating the terminal," added Brett.

Highview will install three main components at Grain: a liquefier, which predominantly comprises compressors and heat exchangers; large tanks to store the liquid air; and to get the energy back, heat exchangers to evaporate the liquid air and a power turbine that expands the gaseous compressed air to drive a generator.

The turbine is not the traditional industrial or aeroderivative gas turbine that is commonly used in the power industry. It is a process gas expander-type turbine, with no combustor or compressor. These simple machines, which run on gases at ambient temperature, are widely used in the chemical process industry for capturing energy from compressed gas streams.

At an estimated installed cost of around $\pounds 3000/\text{kW}$, the energy storage system would have a power output of around 5-6 MW depending on the final choice of power turbine. Highview says this should give it around five hours of operation (about 25-30 MWh) from 300 t of liquid air, making it the largest demonstration of new energy storage technology in the UK.

After considering parasitic loads, Highview expects the system will have an overall electrical efficiency of 50-60 per cent. Fixed operating costs are expected to be "similar to the cost of having an open cycle gas turbine on standby, ready to run". According to Brett, this is in the region of "the low teens per kilowatt/year". He added: "That's the fixed opex but the main opex will be the cost of

electricity needed to charge the system up."

A big plus for the technology is its scalability. According to Brett, it is "totally capable" of being scaled up. "The supply chain as it stands today could deliver a 100 MW, 1000 MWh system without any problem," he said.

Brett added: "One of the huge advantages of this system is that it gets you pumped hydro capability 30 miles from London. One of the big drivers is that it can be located where the demand is, rather than where the geography tells you to put it."

Highview also hopes to demonstrate the system's pure power generation capabilities through the project for Viridor. This installation would use waste heat from an existing reciprocating engine that runs on landfill gas to boost the generating capacity of the site from 7 MWe to 12 MWe.

Unlike Grain, this installation will not have the liquefier onsite; Highview will supply tanks of liquid nitrogen, instead of liquefying air. The tanks will be filled with liquid nitrogen delivered by tanker from a big industrial gas company. Highview will also install a 5 MW (approx.) process gas expander power turbine for utilising heat from the landfill gas engine exhaust.

If this and the Grain energy storage project are successful in the DECC competition, Highview will order the long lead-time components, such as the power turbine and expects the projects to be completed in early 2015.

Although the increasing need to manage renewables integration into the grid will drive the technology, the right regulatory framework has to be put in place if storage technologies are to be rolled out quickly in the UK and in countries like Germany where the need is more pressing.

During the conference launching the CLCF report Tim Evison, Senior Vice President of German industrial company Messer Group GmbH, said: "The [German] market does not provide adequate commercial rates for storage services and so there needs to be some support. There is considerable interest in supporting the development of energy storage and this technology is an interesting alternative to pumped hydro and compressed air energy storage."



Junior Isles

Should the fans get what they want?

As the end of the public consultation on the European Commission's Green Paper on energy and climate policies to 2030 draws nearer, those on the sidelines urging EU politicians to deliver the package they want to see are becoming increasingly vocal. And although not as boisterous as English soccer fans, some are drawing on footballing terminology to state their case.

The renewable energy lobby is calling for binding renewable energy targets, especially as concerns begin to surface over the progress being made towards 2020 targets.

According to 2010 figures, the EU as a whole was on its trajectory towards the 2020 targets, with a renewable energy share of 12.7 per cent. In 2010 the majority of Member States had already reached their 2011/2012 interim targets set in the 2009 Renewable Energy Directive.

However, in a progress report published at the end of March the EC stated that as the trajectory grows steeper towards the end of the decade, greater effort would be needed from the Member States to reach the 2020 targets.

While the EC remains confident that the EU will meet its renewable targets, there are several countries that will not. A recent report by Rabobank claimed it now looks unlikely that the EU 2020 target for 20 per cent renewables will be achieved. Rabobank analyst, Justin Sherrard commented: "... Germany will meet the target, the Netherlands will fail and the UK will fall some place in between."

As the economic crisis continues to bite and finance becomes harder to secure, renewable investment is beginning to falter. However, it may not be so much the fact that less capital is available, but more that investors lack

the confidence to invest in a sector that lacks a medium term plan.

Providing this clarity is one of the key recommendations that the European Renewable Energy Council (EREC) says it will be making to the Commission.

Josche Muth, EREC's Secretary General said: "Because of the economic crisis and the times of austerity, we urgently need to reduce the cost of financing and the cost of medium and long term decarbonisation. This is best done by providing investors with predictability and stability. Our main policy tool, which can be used on a European and then on a national level, is to have a new binding renewable energy target for 2030."

Following the publication of the Green Paper, EREC launched its 'Hat-trick 2030' publication. "We are trying to shoot three goals in one game," noted Muth.

The three goals he speaks of are targets for renewables, energy efficiency and a greenhouse gas emissions target. These goals, says EREC, should be combined in a coherent way.

While the renewables lobby will highlight the merits of binding targets, it is worth noting that the package is an energy and climate package and other low carbon technologies such as nuclear and carbon capture and storage (CCS) should perhaps be given equal consideration.

Muth counters, however, that in its Roadmap to 2050, the EC and the member states supported "no regrets options" i.e. renewables, energy efficiency and infrastructure. "In any scenario, even one with high nuclear, you need a large share of renewable energy, you need more effort on energy saving and efficiency and you need to build the necessary infrastructure."

He added: "Also, we are not shooting for one goal i.e. decarbonising the energy system. We are also looking to be globally competitive and to secure the energy supply. To do this and bring down the cost of [renewable] technologies requires large scale deployment, which will only happen if there are binding targets to provide predictability and stability."

Eurelectric, the association of the electricity industry in Europe, also recently stressed the need to provide clarity for investors. A major study published last month called 'Power Choices Reloaded' concluded: "European policymakers must urgently send a clear policy signal to power sector investors, or risk a 'lost decade' in which the European economy fails to reduce carbon emissions and piles up costs for future delayed reductions."

Clearly, the European Commission needs to act. Placing too much dependence on the EU Emissions Trading Scheme (ETS) to provide the necessary investment signals is a high risk strategy that is already demonstrating its shortcomings.

At the beginning of May, Energy and Environment Ministers from nine European member states set out the action they want to see this year to reform the EU ETS to ensure it remains at the forefront of EU policies to combat climate change and drive low-carbon investments.

They may soon learn, however, there is little point in flogging a dead horse. If the EU wants to guarantee it achieves its GHG reduction targets, it

may do better to simply introduce a carbon tax – regardless of how unpalatable that may be. Market-based mechanisms provide no guarantees when it comes to delivering firm, specific targets.

This is a realisation that is gaining greater acceptance. Muth agreed: "The ETS can be a meaningful tool to steer investment into less polluting technologies. However, it does not provide certainty or any support to investors to go for renewables, CCS or nuclear. It is a highly volatile system, so investors cannot bank on the ETS."

"The most stable and predictable approach the EC can take is to have a CO₂ taxation. The EC tried CO₂ taxation in the 1990s. But anything that sounds like taxation is always blocked by certain member states, not least from the UK, when it is proposed. Yet interestingly enough, the UK's carbon floor price is a carbon tax. It's a fixed, guaranteed price for CO₂ but has just been called something different."

EREC had supported the backloading proposal, which was rejected by the EC and essentially leaves the ETS a "broken" tool. Dr. Johannes Teysen, Chairman and CEO of E.On has, on several occasions, said that the system is broken and needs fundamental reform. If there is no reform, he says the EU should introduce a tax. He believes one possible model for such a tax could follow the UK example, where the tax is the difference between the target price and the real price of emission certificates.

If the EU is serious about "no regrets" options for its 2050 Roadmap, it will have to make some tough decisions on binding targets and carbon taxes, floor prices or any other inventive marketing name for the same thing.

In late May, it took what could be seen as a first step when the European Parliament adopted the Reul Report which calls on the European Commission to propose a binding European renewable energy target by 2030.

"This vote confirms the European Parliament's commitment to basing Europe's future on renewable energy and sends a very strong message to both the European Commission, currently consulting on a 2030 framework for energy and climate policies, and to Member States," said EREC President, Rainer Hinrichs-Rahlwes.

The public consultation on the climate and energy package Green Paper runs until July 2. On the basis of the views expressed by member states, EU institutions and stakeholders, the Commission intends to table the EU's 2030 framework for climate and energy policies by the end of this year.

In the meantime, it's business as usual. On May 9th, the National Oceanic and Atmospheric Administration (NOAA) said GHG emissions remained fractions of a point below the level of 400 ppm, at 399.89 ppm – the highest in more than 3 million years.

Ralph Keeling, a professor at Scripps Institution of Oceanography commented: "I wish it weren't true, but it looks like the world is going to blow through the 400 ppm level without losing a beat. At this pace we'll hit 450 ppm within a few decades."

Not everyone will be happy but perhaps it is time to give the fans what they want, or soon the talk will be of own goals instead of hat-tricks.

