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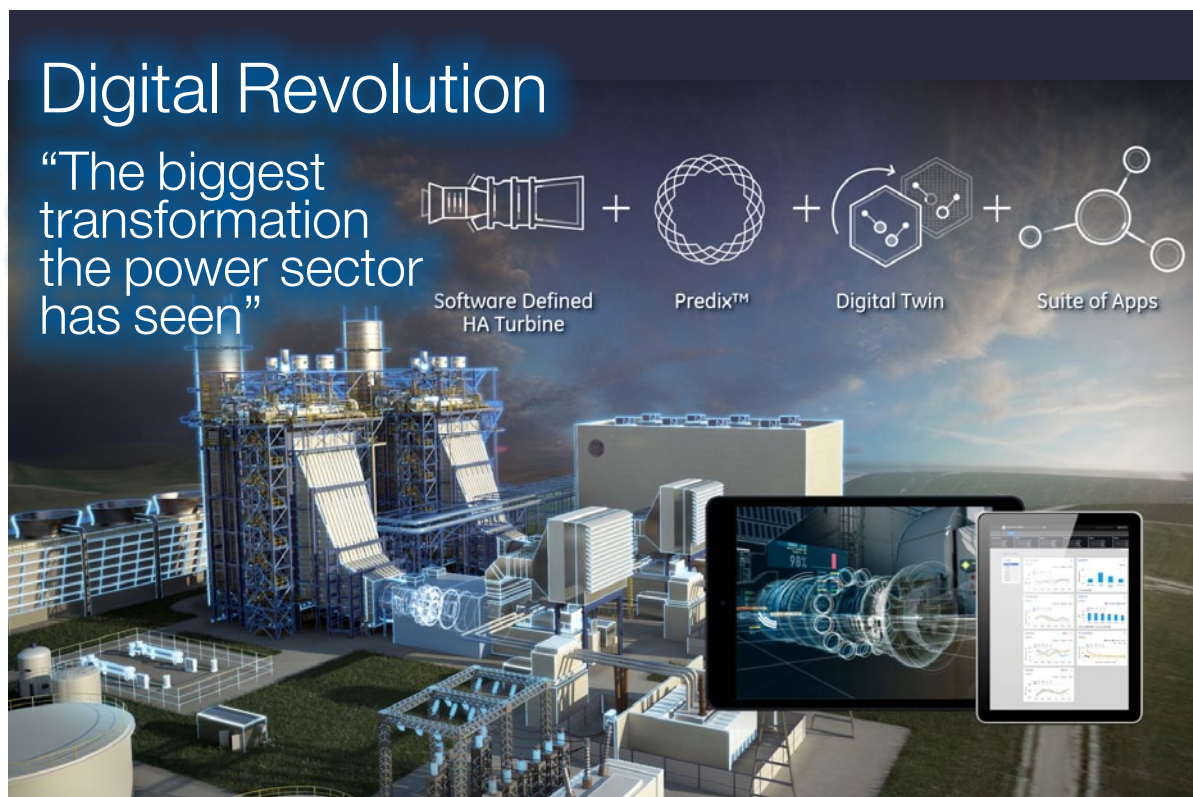
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The power sector will be undergoing a “deep transformation”, say executives Steve Bolze and Ganesh Bell of GE Power. “Energy providers, if they are to meet the challenges of the future will have to join a new breed of digital-industrial companies”. GE has recently unveiled a new “digital strategy” that helps power companies to combine thermal and renewable generation and connect their assets to the industrial internet. “Today, less than 5% of assets in power or energy are connected, but by 2020 more than 10 billion devices will be connected.”

The power industry is facing an historic challenge: it has to provide vastly more power to a growing global

population, increase efficiency and slash carbon emissions. At the same time, it has to cope with a digital

technology revolution that is shaking up traditional business models. “The future of the power sector”, observe Steve Bolze, President and CEO of GE Power and Ganesh Bell, Chief Digital Officer and General Manager Software and Analytics at GE, “is a whole new value chain where both power and information flow in multiple directions and different actors will be able to add value”.

In GE's view, this new value chain encompasses three key elements:

- 1 a digital centralised generation pillar, relying on a mix of fossil fuels and renewables;
- 2 a digital grid, connecting generation and consumption in multiple ways; and
- 3 a digital consumption pillar, which adds demand response capabilities as well as decentralised generation and storage capacities.

Power companies need to find their place in this new value chain. This, say Bolze and Bell, may be viewed as a threat, but it also presents “unprecedented opportunities”. To help companies seize those, GE Power has originated a new “digital vision” for the power sector. Its cornerstones are the open-access Predix cloud-based platform for software developers, which powers a newly conceptualised Digital Power Plant – a ‘Digital Twin’ of a real-life power plant fleet, which can be used to optimise plant operations and develop new applications.

We asked Bolze and Bell how they see the future of the power sector evolve and what role they see for GE's digital strategy.

How necessary is the digital transformation for the energy sector?

Bolze: Over the next 20 years the world is going to need 50% more electricity, and the challenge of bringing that on is totally different to > see page 2

100 years ago. You'll have intermittent renewables, sustainability issues and resiliency issues of the grid. So it's going to be a totally different world going forward. At the same time there is a significant, radical transformation going on in the energy industry, which is all about digital. The digital transformation is going to enable this affordable, sustainable, and reliable power.

What does this transformation encompass?

Bolze: It takes place at the intersection of physical assets with software and analytics capabilities, which didn't exist 20 to 40 years ago. The opportunity here is to do digital right – 75% of failures can be prevented and 8% of the power generated today never gets to the users. Digital solutions can help reduce these numbers and gain more

"By 2020 more than 10 billion devices will be connected and 25 exabytes of data a year created"

efficiency. We announced our first product offering in late September, which is the digital power plant – a revolutionary innovation capturing all the power of the physical asset with software and analytics. And with the

acquisition of Alstom we now have the scale to really go after this opportunity.

Is the digital vision an overhaul or replacement of the conventional power industry?

Bolze: I would say it's an evolution. Digital technology can help improve the performance and sustainability of existing assets, but at the same time it applies to new power facilities.

How did your new strategy for the power sector come about and what does it consist of?

Bell: The driver for the digital vision began with the process of analysing outcomes. In the past outcomes have been about ensuring more reliability, no unplanned downtime, major productivity gains and so on, all associated with single gas-fired power plants or wind turbines. Now our customers are asking for outcomes at the macro level, across an entire plant fleet or wind farm. Those are only possible when you look at the system holistically. And the thing that connects it all is the data.

So what have we done? Our software applications are built on a Cloud-based platform called Predix, and we are making this available to everyone, not just to the energy industry. This is because we wanted a holistic solution that goes across GE and non-GE machines and beyond the single power plant to the entire fleet of operations. On this basis we built a digital power plant. At the heart of this is our next-generation gas turbine, which

is enabled at the core for our digital technology. This means we're now able to install a box that connects all the assets to the Cloud in a secure way and has local computer capabilities and analytical intelligence, which is continuously updated from the Cloud.

What does this digital power plant do?

Bell: At the core of this is an innovation that we call the Digital Twin, which is our key differentiator and something that we believe only a digital industrial company can do. All the physical assets in the real world are modelled in our Digital Twin, and we have a collection of live running physical models in the Cloud that gets richer with every second of operational data. Our customers can buy into this on a subscription base like any web service, and we can also connect applications with the machines and drive a required outcome.

How can older, established companies shoulder the cost of the transition to digital?

Bell: There will be about \$225 billion of value in the industrial internet by 2020. More than a third of that sits in the energy value chain, meaning \$90 billion of that market is energy – everything from generation to transmission to consumption. The interesting thing we're seeing is that the leaders in the industry have been the first to move. For example, Exelon has been deploying asset performance management solutions across their gas-fired fleet, wind business and nuclear. They're also using the platform to start building their own applications.



Steve Bolze

Your concept is based on gas plus renewables. Couldn't renewables operating at maximum efficiency via the digital platform make thermal power redundant?

Bell: We believe that the silver bullet for energy is not a single source of fuel, but the optimisation of the mix of fuel sources. That mix is going to differ across geographies and regions because of different policies and fuel availability. So our vision is about optimisation of the available mix of energy sources and driving maximum efficiency. You have to keep the grid stable; you need software to drive the predictability of intermittent fuel sources like solar and wind, but you also need software to ensure that gas can compensate for fluctuation and demand on the grid. We can make



Ganesh Bell

our biggest gas turbine behave like a virtual battery – you can start it fast and get power to the grid very quickly, so while your agenda may be renewables, you will need gas to compensate for fluctuations and make the grid stable.

Where are we in this transformation and where will it lead to?

Bell: Right now, less than 5% of assets in power or energy are connected, but by 2020 we believe that more than 10 billion devices will be connected and 25 exabytes of data a year will be created.

Bolze: I've been at GE for 23 years, and it's probably the single biggest transformation I see in the whole company going forward over the next decade plus. ●

Leapfrogging the West What the world can learn from Africa



Africa's energy potential is the most underestimated in the world, says Bonang Mohale, the World Energy Council's Vice-Chair for Africa. But Africa's future energy system will not look like the one that currently exists in the West, add two energy leaders who are part of the Council's extensive African network: "Africa will leapfrog the industrial nations. It will move straight to the low-carbon energy system of the future," say researcher Taha Selim Ustun and entrepreneur Samir Ibrahim. "And this will create untold new opportunities." World Energy Focus looks at what the world can learn from Africa.

Talk to energy experts in Africa, and they are likely to come up with the mobile phone analogy. "When mobile phones first came to Africa", says Rwanda-based Taha Selim Ustun, Assistant Professor of Electrical and Computer Engineering at Carnegie Mellon University, "everyone was convinced they would be there only temporarily, until people got connected

to landlines. But the landlines did not materialise. Africa leapfrogged straight into the era of mobile telephony and now has one of the highest mobile telephone penetrations in the world."

What is more, says Ustun, with the mobile telephone came new opportunities, such as the creation of mobile money, which was invented in

Kenya. "Many business transactions in Africa are now made with sim cards on mobile phones over mobile networks."

Ustun is convinced that this story will repeat itself in the energy sphere. "In western countries there are a lot of legacy systems. Every time when someone has a good idea for something new, the question is always, how does it fit into the existing system? In Africa we can simply ask, what are the best options? How should we design the system?"

GRANDMOTHERS

Ustun and his team, who are part of Pittsburgh-based Carnegie Mellon University but operate full-time in Rwanda, did just that

Training workers to install solar panels at health clinics in Rwanda
photo Sunepi USAID

<http://bit.ly/1jAeuEc>: they compared the cost of laying out centralised grids to decentralised options based on renewable energy, storage and microgrids. "We found that when you have to lay a transmission cable from the main grid to a village, after 4-5 kilometres the breakeven point is reached, compared to a decentralised solution. Microgrids with renewable energy can give us cheaper and cleaner energy, not dependent on the outside world, with more employment opportunities."

In some projects villagers come to own the energy system, which is a good way to prevent vandalism, says Ustun. In Tanzania they even sent elderly women (only grandmothers were eligible) to India for a six-month power electronics course. "They came back as power technicians and now run the energy system." Why grandmothers? "Because young people tend to leave the village when they have learned skills."

There are many more examples of African-grown innovation. For instance, Ustun and his team developed a 'smart scheduling' app <http://bit.ly/1HjlkGd> that can be used in rural clinics that rely on off-grid solar power systems. "The problem for these clinics is that they often have blackouts when too much power is used. Based on solar radiation profiles, we calculated maximum loads

at various times of day. Now doctors can schedule when they can use electricity without causing blackouts. They do this with their mobile phones." For a presentation of this project go to <http://bit.ly/1laDvYr>

AFRICAN DREAM

Another area where Ustun sees great opportunity for innovation is in "smart farming". "With sensors in the field connected to smart energy systems, you can know exactly when and how much irrigation or fertilisation is needed. And when you have a biodigester, you can use that to generate electricity > see page 4

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SunCulture agrosolar irrigation kit

from the farm waste. Instead of doing things blindly, farms can work much more efficiently. They can even help with load management of the grid.” Visit <http://bit.ly/1MXXWAM> for more on this project.”

Agriculture is also the area in which Samir Ibrahim, co-founder (with Charles Nichols) of the Kenyan company SunCulture, is active. SunCulture, founded in 2012, designs and sells solar-powered drip irrigation systems that lead to higher yields (up to 300%) and less use of water (up to 80%).

For Ibrahim, a graduate of New York University who quit his job at PriceWaterhouseCoopers to pursue his African Dream, Africa is all about “creative relevance”. To become successful in Africa, he says, you have to provide things that are relevant to the people, which requires a lot of creativity. “When my partner and I came to Kenya, we had a new technology, a solar-powered drip irrigation system, but we realised it’s not just about technology. It’s about offering a complete solution. So we spent the

first seven months doing field trials and watching how farmers actually work to find out what they really needed.”

Ibrahim discovered that the biggest problem for farmers was the “extremely fragmented value chain” in agriculture. Hence they designed their company to be able to supply everything the farmers need: installation, training, after-sales support, and so on.

Ibrahim is convinced that the creative solutions developed in Africa are relevant to Asia and the western world as well. “For example, a problem many people are confronted with here is how to make someone bankable who doesn’t have assets to collateralize. Companies have now come up with a creative solution: they devise alternative credit scores based not on bank statements but things like phone airtime usage, mobile browsing and mobile money transactions. Such solutions could work in the US as well.”

AFRICA RISING

To develop the continent’s huge potential, policymakers and investors

“need to keep the end user in mind”, says Ibrahim. “The reality is here on the ground, not on the 32nd storey of a building in New York.”

He notes that “there is a lot of money flowing into Africa”, from funds such as the Green Climate Fund, which can sometimes look at impact in an impractical way. “When a fund is created, investors create a investment thesis and then a mandate is set outlining future investment parameters. One problem we see is that these parameters are being set without speaking with implementers on the ground. What that translates into is a lot of money coming in managed by a fund manager who then has to tick the boxes to justify an investment. We have had it happen to us many times - funds have offered us money on condition that we changed our business model to make it fit with their mandate. This doesn’t make sense to us. It is sometimes difficult to refuse such offers, though.”

Refuse them they did, however. SunCulture, originally funded by ‘friends and family’, is now raising its first equity round, says Ibrahim. They hope to raise \$4 million.” With that money, they want to become “the pan-African irrigation powerhouse and bring affordable solar-powered irrigation to farmers everywhere”. “If we pull this off”, says Ibrahim, “we will see a very different continent.”

“This is a story of Africa rising”, confirms Bonang Mohale, the World Energy Council Vice-Chair for Africa and

Chairman of Shell South Africa. He notes that Africa is the most underestimated continent in the world. “It is known by drought, famine, war, not by its potential, its development. We have a quarter of the world’s arable land. We have tremendous renewable energy resources. Over 300 days of sunshine. Huge rivers to provide hydropower. The Zambezi alone has enough power to electrify the whole of Africa.”

There are many great and small projects going on in Africa that the world can be inspired by, says Mohale, ranging from the huge 6,000 MW Grand Ethiopian Renaissance Dam to the tremendously successful renewables auctions in South Africa, with 5,200 MW committed to date. These South African bidding rounds saw solar prices fell 76% and wind prices 50% over the course of just a few years.

Nevertheless, Mohale does not believe Africa has the luxury to reject conventional forms of energy supply, such as gas and coal fired power plants, nuclear power plants and centralised grids. “It’s not either-or, it’s and-and”, he says. “There are just too many people with a growing need for energy to rely on renewables alone.”

The case for the expansion of domestic gas production is particularly compelling, says Mohale. “Even if we bring only 5% of Africa’s resources to production, it will create 300,000 sustainable jobs and \$80 billion in public rent.” ●

ABOUT WORLD ENERGY FOCUS

The **World Energy Focus** magazine is published monthly by Energy Post Productions.

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The growing risks of stranded fossil fuel assets

With the gradual shift to a low-carbon society, investment in new fossil fuel activities will be scrutinised increasingly carefully. Some analysts warn that trillions of dollars in fossil fuel assets already run the risk of becoming “stranded”. They urge investors to re-evaluate their portfolios and governments to stress-test their national resources.

The NGO that invented the concept of ‘stranded assets’ (also known as ‘the carbon bubble’), London-based Carbon Tracker Initiative (CTI), in November came out with a new analysis [<http://bit.ly/1PyT8ph>] showing that, if ambitious climate policies are followed, over \$2 trillion of new and existing investment is in danger of being wasted over the coming decade.

According to Carbon Tracker, if a 2-degree scenario is followed, “no new

coal will be needed, oil demand will peak around 2020 and growth in gas will disappoint industry expectations”. The US has the greatest financial exposure with \$412 billion of unneeded fossil fuel projects to 2025 at risk, followed by Canada (\$220bln), China (\$179bln), Russia (\$147bln) and Australia (\$103bln).

The companies that represent the biggest risk are a mix of state and listed companies, including oil majors Royal

Dutch Shell, Pemex, Exxon Mobil, and coal miners Peabody, Coal India, and Glencore. Around 20-25% of oil and gas majors’ potential investment is on projects that will not be needed in a 2°C scenario, says CTI.

CTI recommends for investors to “derisk their portfolios”, for governments to “stress-test their national resources, infrastructure and energy plans”, and for energy companies to “provide information on the decisions taken to align the company with a 2 °C scenario”.

DIVESTMENT MOVEMENT

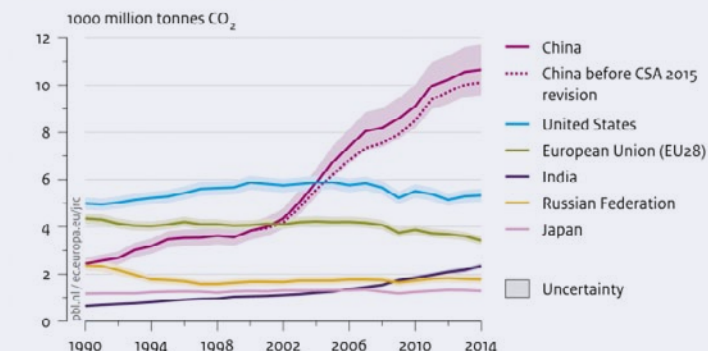
Fossil fuel producers are not just confronted with climate policies, they are also the target of a growing “divestment movement”. German insurance company Allianz in November was only the latest in a series of prominent investors announcing its divestment from coal assets. Allianz, one of the largest financial institutions in the world with €2 trillion in assets, says the decision will result in a shift of some €4 billion in its portfolio. The French National Assembly has adopted a resolution encouraging public investors not to invest in fossil fuels anymore.

Christoph Frei, Secretary-General of the World Energy Council said: “The scenarios report we published in 2013 highlighted that the investment risk could dramatically increase for certain carbon intensive technologies. Stranded assets are a real issue for industry, investors including pension funds and policy makers alike.” ●

CO₂ emissions stall in 2014

In 2014, the growth in global CO₂ emissions from fossil fuel use and cement production slowed down to only 0.5% compared to 2013, while the world’s economy grew by 3. China and the US increased their emissions by 0.9%. In the EU, CO₂ emissions decreased by an unprecedented 5.4%, while India’s emissions increased by 7.8%.

CO₂ emissions from fossil-fuel use and cement production in the top 5 emitting countries and the EU



Source: EDGAR 4.3 (JRC/PBL 2015) (1970-2012; notably IEA 2014 and NBS 2015); EDGAR 4.3FT2014 (2013-2014); BP 2015; GGFR 2015; USGS 2015; WSA 2015

www.pbl.nl

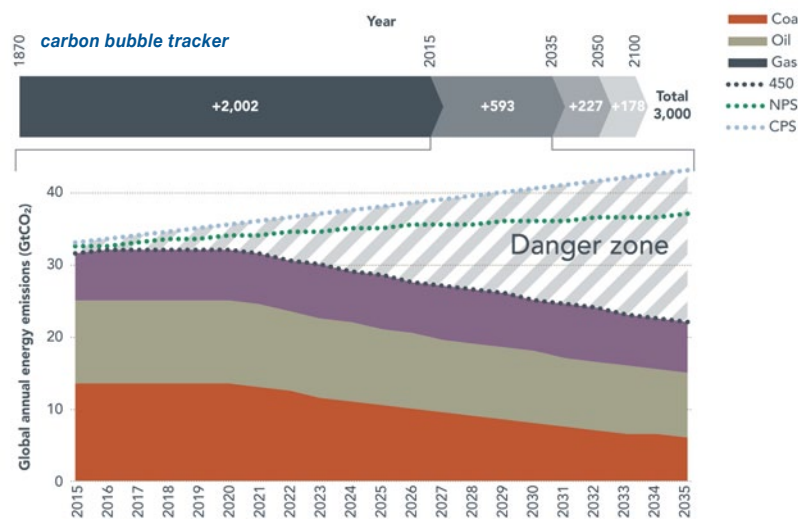
The six largest emitting countries/regions in 2014 were: China (with 30%), the United States (15%), the European Union (EU-28) (9.6%), India (6.6%), the Russian Federation (5.0%) and Japan (3.6%).

Together these four countries/regions account for 61% of total emissions from fossil fuel use and industrial processes. For the first time since 1998, per capita primary energy consumption decreased in 2014.

These are some of the main conclusions from the annual report Trends in global CO₂ emissions [<http://bit.ly/1POHs1x>] by PBL Netherlands Environmental Assessment Agency

and the European Commission's Joint Research Centre (EC-JRC).

New emission data, including recent coal statistics, show China's CO₂ emissions currently to be twice as high as those in the US. However, per capita emissions in the US are twice as high as those of both China and the EU. China's high ranking is caused by the sheer size of its population and its reliance on coal. ●

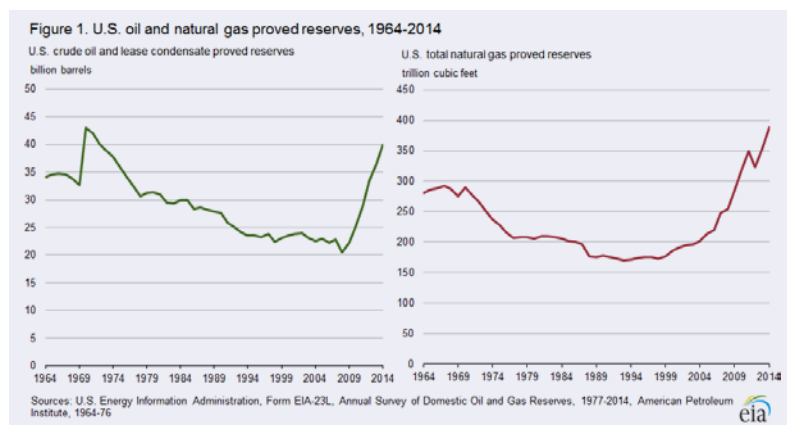


US proven oil & gas reserves keep rising

While the US in recent years has grown into the world's biggest oil producer and (by far) biggest gas producer, its proven reserves of oil and gas have also continued to rise.

According to the latest figures from the US Energy Information Administration [<http://1.usa.gov/1i4v8li>], released in late November, US crude oil reserves last year increased for the sixth year in a row with no less than 3.4 billion barrels (+9%). Natural gas reserves increased 10% to a record 388.8 tcf (trillion cubic feet), despite record high production. Proven reserves are those that geological and engineering data demonstrate with reasonable certainty to be recoverable in future years from known reservoirs under existing economic and operating conditions.

The amazing American oil and gas story is summarised in the graph below. ▼



China jumps on the electric bus

China has ushered in an electric bus investment boom since 2014, according to a recent report on website Clean-technica. In 2014, 27,000 electric buses were sold, soaring by 160% from the previous year. Sales kept growing rapidly in the first half of 2015, approaching 20,000 vehicles. It is expected that China will sell 154,000 electric buses in 2020, with a compound annual growth rate of 33.6% during this period.

Petrol-powered buses are still being subsidised by the Chinese government to encourage public transport, but subsidies are gradually reduced and replaced by incentives for electric buses. Planned investment in electric buses announced by key bus makers nationwide will exceed RMB21 billion (\$3.36 billion) in 2016 and 2017. ●

Remarkable nuclear turnaround in UK

The UK government has announced a £250 million nuclear R&D program to “revive the UK’s nuclear expertise”, reports the World Nuclear Association (WNN). The research is intended to position the country as “a global leader in innovative nuclear technologies” and will be especially aimed at developing small modular reactors (SMRs).

Although the UK was a pioneer of nuclear power development, since the 1980s there has been no significant fuel cycle R&D or reactor design undertaken in the country, notes WNN. A competition is planned to identify the best-value SMR design for the UK, paving the way for building one of the world’s first new-generation SMRs in the country in the 2020s. The decision follows a December 2014 feasibility report by a consortium led by National Nuclear Laboratory into the potential impact of SMR technology on the UK energy sector and the UK nuclear supply chain.

The UK government’s announcement is part of a broader innovation program which includes seed funding for promising new renewable energy technologies and smart grids but scraps a planned £1 billion fund for carbon capture and storage (CCS), with nuclear power considered to have more potential than CCS. The UK has plans for 18 GW of new nuclear power capacity by about 2030, sourced from France, US and China. At the same time, the UK has announced its intention to close all “unabated” – not fitted with CCS – coal-fired power stations by 2025. ●

India takes centre of global energy stage

India is set to contribute more than any other country to the rise in global energy demand over the next 25 years, although its energy demand per capita in 2040 will still be 40% below the world average, according to a special report, India Energy Outlook 2015, launched on 27 November by the International Energy Agency (IEA).

Policymakers must redouble efforts to bring capital into the sector,

particularly in more efficient and low-carbon technologies, says the IEA. “India’s energy transformation requires three things: investment, investment and investment,” said IEA Executive Director Fatih Birol. “A lot is being done already to overhaul the energy regulatory system and get the incentives in place; this is vital, as India will need to call upon a wider range of investors and sources of finance than it has in the past.” ●

NEWS IN BRIEF

COLOMBIA ON SUSTAINABLE MISSION

The Government of Colombia and the Inter-American Development Bank have launched the Sustainable Colombia Initiative. With a 15-year outlook divided into three phases, the first phase of Sustainable Colombia will seek to leverage \$600 million in new funding from the international community. This figure will be part of the \$1.9 billion Colombia hopes to receive over the next five years in investment to tackle the issues addressed by the initiative.

EGYPT’S RENEWABLES SECTOR SET FOR STRONG GROWTH

As Egypt’s installed power capacity is set to nearly double from 31 GW in 2013 to 60 GW in 2020, renewables will play a key role and present an opportunity of \$13 billion in investment and development, according to consultancy Frost & Sullivan. Egypt plans to reach 20 percent of its total power for a total of 11.32 GW from renewables by 2020, across wind, photovoltaic, concentrated solar power, and hydroelectric projects, according to a report by the Regional Center for Renewable Energy and Energy Efficiency.

GLOBAL WIND POWER MARKET SOARS

The global wind market is headed for a second consecutive record year in 2015, according to FTI Intelligence. New installations globally in 2015 are expected to reach 59 GW, compared to the 52 GW installed in 2014. Total installations for 2015-2019 are now expected to reach 264 GW. Danish producer Vestas leads the market, followed by Chinese manufacturers Goldwind and United Power.

Paris 2015: climate-related energy investment is taking off

Instead of our usual Country Focus, this month a special Global Focus, in which we present an overview of major climate-related energy investments announced during and before the Paris Climate Summit. An updated list can be found on the website of the UN Framework Convention on Climate Change (UNFCCC) <http://bit.ly/1OKjcwj>.

FUNDS FOR DEVELOPING NATIONS

Developed countries announced pledges totalling \$10.1 billion for the **Green Climate Fund**, established by the UNFCCC at the Climate Summit in Cancun in 2010 to assist developing countries in implementing climate policies. This includes a pledge of \$2.65 billion from Canada. French Finance Minister Michel Sapin said that the \$100 billion/year goal of the Green Climate Fund is “perfectly within reach”.

A group of 11 countries, including France, Germany, the US and UK, made a joint pledge of \$248m to the **Least Developed Countries Fund**, which helps the world's poorest nations draw up national adaptation plans to identify their climate vulnerabilities.

The **UK Department for Energy and Climate Change** has formed a joint venture with the **Green Investment Bank** to channel \$304 million into clean energy and energy efficiency projects in India, South Africa, Kenya, Rwanda and Tanzania through the **UK Climate Investments fund**.

France will double investments in renewable energy generation across the **African continent** to \$2 billion between 2016 and 2020. In addition, Paris will triple to €1 billion a year by 2020 its contribution to Africa's battle with desertification and other climate change challenges.

Austria will strive to provide €500 million in climate finance between 2015-2020. **Italy** will increase its support for international climate finance to \$4 billion between 2015-2020.

Norway will maintain its climate finance support at \$400 million per year. **Spain** announced a doubling of its efforts to \$900 million by 2020.

Foreign investors have poured \$3 billion into the renewable energy sector in **Pakistan**, officials from the **Alternative Energy Development Board** (AEDB) have said. 1.2 GW of new solar capacity is expected to be built by 2018.

MULTILATERAL DEVELOPMENT BANKS

African Development Bank: to triple climate financing to \$5 billion annually by 2020.

Asian Development Bank: to double climate financing, up to \$6 billion annually by 2020.

European Bank for Reconstruction and Development: to increase share of climate financing from 25-40% of annual commitments by 2020; this will provide \$20 billion over the next five years.

European Investment Bank: to finance \$20 billion a year globally for the next five years, equal to 25% of its overall lending.

Inter-American Development Bank: to double the volume of its climate finance by 2020, increasing from an average of 14% of annual commitments over the last three years to 25-30% average commitment by 2020.

World Bank Group: a one-third increase in climate financing from 21-28% of annual commitments by 2020, reaching \$16 billion a year in public finance.

SOLAR ALLIANCE

India's Prime Minister Narendra Modi, and **François Hollande, France's president**, launched an **International Solar Alliance**, an Indian initiative dedicated to the promotion of solar energy “to bring affordable solar power to villages that are off the grid”. India will provide \$62 million over five years to 2020/21, including in-kind support such as land and \$27m of funding towards running costs. The alliance hopes to mobilise “more than \$1,000bn of investments that are needed by 2030 for the massive deployment of affordable solar energy”.

CLEANTECH COALITION

A group of 28 investors — including Microsoft's **Bill Gates**, Facebook's **Mark Zuckerberg** and Amazon's **Jeff Bezos** — have founded the Breakthrough Energy Coalition [<http://bit.ly/1HC1bAc>] which pledges to support early stage clean energy technologies. The investors will focus on projects coming out of the 19 countries that have created the Mission Innovation coalition [<http://mission-innovation.net>]. This includes countries such as Canada, Germany, India, Japan, Saudi Arabia, the UK, the United Arab Emirates and the US.

CLIMATE RESILIENCE

A new initiative to build climate resilience in the world's most vulnerable countries [<http://bit.ly/1TvoURR>] was launched by **UN Secretary-General Ban Ki-moon** and 13 members at COP21. The **Climate Resilience Initiative** will help address the needs of the nearly 634 million people, or a tenth of the global population who live in at-risk coastal areas. The Initiative will support the work of partners, such as **Africa**



Human chain in Paris in place of the giant march that was prohibited [photo 350.org]

Risk Capacity, to ensure that by the time the new climate agreement enters into force in 2020, over 30 countries are provided with \$2 billion in coverage against drought, flood and cyclones.

CARBON PRICING

The **World Bank, Germany, Norway, Sweden and Switzerland** launched a scheme to promote carbon pricing in developing countries. The Transformative Carbon Asset Facility (TCAF) aims to secure \$500 million in initial funding to “spur greater efforts to price and measure carbon pollution” [<http://bit.ly/1pXmSS>]. Jim Yong Kim, the World Bank president, said the facility's country partners “expect to commit more than \$250m next year” [<http://bit.ly/1jAnk4O>]. The TCAF is a complement to the Carbon Pricing Leadership Coalition [<http://www.carbonpricingleadership.org>], another World Bank initiative. ●

REGIONAL EVENT

Africa Energy Indaba

Johannesburg, South Africa

16-17 February 2016

The Africa Energy Indaba (AEI) is the foremost African energy event



for energy professionals from across the globe. The event gathers international and African experts to share their insights and solutions to

Africa's energy crisis, while exploring the vast energy development and investment opportunities in Africa. The AEI has been designated the World Energy Council's African regional event and is presented by the South African National Energy Association (SANE), the Council's national committee. It is supported by the African Union Commission and the NEPAD Planning and Coordinating Agency.

www.africaenergyindaba.com

2016 World Energy Congress

Istanbul, Turkey

9-13 October 2016

With only 10 months remaining until the 23rd World Energy Congress kicks off in Istanbul under the theme "Embracing New Frontiers", more than 100 top level energy leaders from 41 countries have confirmed to speak.

The World Energy Council invites authors to provide their insight by the end of February next year on a theme of their choice relating to the following four topics:

- **World Energy Scenarios:** What if ...? Overall energy scenarios to portray potential pathways into the future to help us better understand critical uncertainties and decision points.
- **World Energy Resources and Technologies:** What are the key messages of energy resources and

innovative technologies? Special focus on the following resources: Coal, Oil, Bioenergy, Waste, Peat, Geothermal, CCUS, Gas, Uranium & Nuclear, Hydropower, Marine, Wind, Solar, Energy Storage, Energy Efficiency Technologies, e-Mobility

- **World Energy Trilemma:** The Trilemma is a 21st century policy framework for evaluating the degree to which energy options are (1) secure; (2) affordable; and (3) environmentally sensitive. Addressing the energy trilemma presents extraordinary environmental, social, and economic challenges requiring national and international action by not only governments, but also the private sector and civil society.
- **Financing Resilient Energy Infrastructure:** Resilience as a concept can be framed as an ambition as to how the best boardrooms respond to the changing risks landscape and

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global economic uncertainty. Resilience thinking requires embedding anticipation of uncertainty into both market and infrastructure designs to ensure that energy systems are able to respond to any sudden, unanticipated event. Embedding the concept of resilience within energy decision-making is of increasing importance in all parts of the world and is critical for meeting the goals of the energy trilemma.



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Asia-Pacific Energy Leader's Summit - Delivering Resilient Energy Infrastructure

Wellington, New Zealand

16-17 March 2016

The Leader's summit will explore how the Asia-Pacific energy system can build resilience and prepare for the new normal. Providing a unique platform to challenge ideas and look to future-proof the energy systems of the Asia-Pacific region, participants will seek to develop a shared understanding of the growing resiliency risks and challenges presented by climate change, emerging technologies, extreme weather events, cyber security, and the energy water-food nexus. The summit, preceded by a Future Energy Leaders event and an Asian Regional Meeting on the 15th of March, will give Asia-Pacific energy leaders an opportunity to discuss existing and emerging solutions and/or mitigate these risks and challenges.

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SEE MORE COUNCIL EVENTS AT
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ABOUT THE COUNCIL

The World Energy Council has been at the forefront of the energy debate for nearly a century, guiding thinking and driving action around the world to achieve sustainable and affordable energy for all. It is the UN-accredited energy body and principal impartial network, representing more than 3,000 organisations – public and private – in almost 100 countries.

Independent and inclusive, the Council's work covers all nations and the complete energy spectrum – from fossil fuels to renewable energy sources.

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