

BACK IN BLOOM

Japan flourishes after Fukushima

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More to be done
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Mission 2020 calls for “bending of curve”

A new campaign launched by ex-UN climate chief Christiana Figueres says businesses, investors and policymakers must start bending the curve on climate change by 2020.

Former Executive Secretary of the United Nations Framework Convention on Climate Change (UNFCCC), Christiana Figueres, has identified the year 2020 as a game changing opportunity to turn the tide on the impacts of carbon emissions.

Speaking at the recent launch of the Mission 2020 campaign, Figueres said: “This is a call for collective intentionality to make sure that we do not pass the 2020 milestone as being the moment at which we truly bend the curve and show the world that we have begun to reduce emissions.”

Drawing on findings from a newly published report—“2020: The Climate Turning Point”—the campaign will highlight why the 2020 turning point is necessary, and importantly how it can be realistically achieved. The new report summarises the most up to date scientific basis for urgent action to reduce carbon emissions and provides a roadmap of action to 2020. It shows how renewable energy is progressing in replacing fossil fuels as new sources of electricity around the world with more

needing to be done on transportation, targeting 25% of vehicles on the road to be electrical by 2020.

GDP decoupling

Figueres noted that while the goal is challenging, progress is being made. “... we are on our way,” she said. “For the last three years, we have been at flat emissions globally, while we have continued to increase GDP by at least 2-3% a year.”

This was echoed by Fatih Birol, Executive Director of the International Energy Agency. Commenting on the campaign, he said: “Three years of flat emissions in a growing economy is a cause for optimism, even if it is too soon to say emissions have peaked. An early peak of emissions around 2020 is critical, and as the IEA has shown in our recent analysis, it is well within

40 Gt/year:
current rate of global emissions



Call to action: Christiana Figueres

reach with existing technology and proven policies.”

Figueres highlighted, however, that time is running out and there is little room to manoeuvre. “The science shows the world can only emit a further 800 Gt of CO₂ before reaching the point at which irreversible climate change will be reached. At the current rate of about 40 Gt/year, we only have 20 years at the current level of emissions,” she noted. This is why the science says we need to bend the curve by 2020 so that we can achieve a decarbonised economy by 2050.”

Professor Lord Nicholas Stern also stressed the urgency of the need for action, noting that if the Paris target of holding global temperature increase to well below 2°C is to be met, there “must be an acceleration in the transition” to low-carbon growth and development. ■

NEWS IN BRIEF

WIND POWERED OIL RECOVERY CONCEPT MOVES CLOSER

The WIN WIN (WIND powered Water INjection) project has completed its first phase and determined that wind power could be used to power offshore water injection. The project is now moving into its second phase. It consists of four partners: DNV GL, ExxonMobil, ENI Norge and the Norwegian Research Council. The next phase will also help to develop the economic feasibility of wind and other renewables in complex environments with demanding functional requirements.

ARAB COUNTRIES SIGN MOU ON JOINT ELECTRICITY MARKET

Fourteen Arab countries have signed a memorandum of understanding to establish a joint Arab electricity market. Speaking at the signing, Saudi Minister of Energy, Industry and Mineral Resources Khalid al-Falih stressed the importance of enhancing the Arab joint action on electrical energy. He added that the electricity linkage project with Egypt would support the joint Arab power market, which he hoped would be linked in the future with European and African power networks.

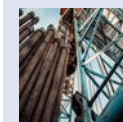
INDIA, UK AGREE ON ENERGY COOPERATION

India and the UK have agreed on priority areas for further collaboration in the energy sector. Under the India-UK ‘Energy for Growth’ dialogue, work will focus on: innovation in smart technology to improve performance and reduce losses in India’s power sector; financing for clean energy; decentralised energy scale up and sustainability; and support for states in renewable energy planning and deployment.

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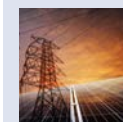
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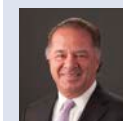
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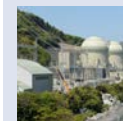
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Tracking progress towards sustainable energy

Progress on meeting goals for energy access, renewable energy and energy efficiency fell short of what is needed to meet 2030 targets

Some countries are doing more than their fair share when it comes to meeting sustainable energy goals, however global progress has been slower than required, according to a new report.

The Global Tracking Framework 2017—Progress Towards Sustainable Energy, produced by the Sustainable Energy for All (SEforALL) Knowledge

hub, in partnership with the World Bank and other agencies including the World Energy Council, shows that at the current rate of progress, only 91% of the world will have electricity access in 2030, while only 72% will have access to clean cooking facilities.

Meanwhile, the share of renewables uptake is only expected to be 21% by

that time, while improvements in energy intensity are also expected to fall short of the 2030 goal.

The SEforALL objectives of universal access to modern energy, doubling the rate of energy efficiency, as well as the global share of renewable energy by 2030, have been put in place because the organisation believes that energy is the cornerstone of economic growth. With access to modern, reliable and affordable energy, a child can study at night, small businesses can thrive, women can walk home under the safety of working streetlights and hospitals can function efficiently and save lives.

The report concludes that not only do governments need to make bolder policy commitments in order to reach the 2030 goals, but more investment and willingness to embrace new technologies is also needed.

Electricity

In 2014, access to electricity globally increased by just 0.3%, up only slightly from 85.0% in 2012, representing a slowdown from previous years. Worldwide, about three times the population of the United States still lived without electricity in that time. Africa has been particularly slow to bring access to electricity to its population at the same rate as the population has grown, but there are notable exceptions.

80% of global energy consumption is in the heat and transport sectors

Countries like Kenya, Malawi, Sudan, Uganda, Zambia and Rwanda increased their electrification by 2 to 4 percentage points annually in the 2012–2014 period.

Cooking

In 2014, access to clean fuels and technologies for cooking climbed to 57.4%, up slightly from 56.5% in 2012. Most of the 3.04 bn people who lived without access to clean cooking fuels were in Asia, and to a lesser extent Africa, where it does not appear to be a policy priority. Only a small handful of countries are showing encouraging progress on access to clean cooking, most notably Indonesia, Peru and Vietnam.

Energy efficiency

Progress in energy efficiency accelerated between 2012–2014, leading to energy savings equivalent to the entire energy consumption of both Brazil and Pakistan in 2014. Countries like China, Mexico, Nigeria and the Russian Federation led the way, with significant improvements in industry and transport.

Renewables

The share of renewable energy in the world's total final energy consumption increased slightly from 17.9% in 2012 to 18.3% in 2014. New power generation technologies such as wind and solar are growing rapidly, but from a very small base. How rapidly the world's 20 largest energy consumers meet demand with modern renewables is key, as is increasing reliance on renewables in the heat and transport sectors, which make up 80% of global energy consumption. ■



Rising: Tight oil production

Rising from the ashes

The Permian basin will lead a US production recovery in 2017

After a two-year downturn, America's tight oil business is mounting a strong comeback. The shale producers that have come through the other side of the downturn—and many did not—have pushed their costs lower by as much as 40% and learned how to squeeze more crude out of each well they drill. The result has been crashing breakeven

prices across the sector, with huge swathes of tight oil basins that needed \$80-a-barrel-plus oil prices a couple of years ago now able to make money with oil in the \$50s.

Much of the cost reduction has come from simply leaning on suppliers to slash their fees. Suppliers who were desperate to hold on to what little

business they could get agreed, but this is proving unsustainable as business picks up, demand for services and crews tightens the market and service companies start charging more again. Most operators are building a 10–15% increase in service costs into their 2017 models.

They've also embraced technologies

Over the past year, more than \$20bn in deals have been done in the Permian

such as automation and data analytics that are delivering sustainable cost reductions. The great legacy of the downturn could be that shale producers simply got better at what they do. Producers have started drilling longer lateral wells, of 10,000 feet-plus, and pumping more sand and proppant through more frack stages. The amount of oil recovered from each well rose by around 25% in 2016, according to consultancy Rystad Energy, and there is no sign yet of that slowing.

Rebound

The 18 largest US-focused independents are on track to lift investment by 58% compared to last year, to \$36.5bn, according to Raymond James—an investment bank. It is a strong rebound, though still only around half 2014's spending levels.

A return to production growth will follow—the Energy Information Administration (EIA) now sees Lower-48 output, driven by shale, rising from 6.54m barrels a day at the end of 2016 to 7.25m b/d at the end of this year. It equates to around 60% of Opec's agreed 1.16m b/d in supply cuts.

The recovery is so far mostly a Permian story. The play, which spans a vast area of western Texas and southeast New Mexico, has come roaring back to life after going through a rough patch

when prices crashed in 2015. The rig count has almost trebled, from 133 in May last year to 319 at the start of April. Around half of all oil rigs working in the US are now in the Permian.

What is setting the Permian apart is its huge resource base and continued improvements in well economics, thanks to a combination of more productive wells and falling costs. It is allowing producers to continue lifting output at much lower prices than previously thought possible.

In 2016, when prices dipped below \$30/b, Permian producers still managed to add 253,000 b/d of supply, bringing production at the end of the year to 2.09m b/d. Data for the early months of 2017 is still coming in, but EIA estimates point to production growth picking up steam on higher activity levels.

Over the past year, more than \$20bn in deals have been done in the Permian. The flurry of acquisitions has sent land prices soaring. Recent deals have valued the play at more than \$40,000 an acre, prompting talk of a “Permian bubble.” The Permian is increasingly becoming a stomping ground for the supermajors, including Chevron, Exxon Mobil Apache, which are supplanting the pioneering independents that proved the basin's potential.

Challenges remain, such as finding manpower and equipment, as well as supplies of water and sand, and more pipeline infrastructure is needed.

But these operational challenges have been overcome in the past, and in all likelihood the Permian bull run is just getting going. ■

Bright forecast ahead for solar energy?

Solar costs continue to fall, recently hitting less than 3 cents/kWh in some parts of the world. But the scaling back of incentives and constraints of the existing electricity infrastructure could hinder future expansion.

While photovoltaic (PV) solar power only generated about 1% of the total electricity produced globally in 2015, it represented about 20% of new capacity additions. Growth has been impressive and looks likely to continue. The International Solar Alliance has set a target of at least 3000 gigawatts (GW), or three terawatts (TW) of additional solar power capacity by 2030, up from the current installed capacity of around 300 GW.

Yet some experts believe even the most optimistic projections have under-estimated the actual deployment of PV over the last decade, and say the annual potential of solar energy far exceeds the world's energy consumption.

In mid-April, scientists from the US Department of Energy's National Renewable Energy Laboratory (NREL), their counterparts from similar institutes in Japan and Germany, along with academic and industry researchers, assessed the recent trajectory of PV and outlined a potential worldwide pathway to produce a significant portion of the

world's electricity from solar power. In a new science paper—Terawatt-Scale Photovoltaics: Trajectories and Challenges, published by the Global Alliance of Solar Energy Research Institutes (GA-SRI) —they said 5-10 TW of PV capacity by 2030 is realistic.

Solar threats

While solar has a bright future, there are several threats to its development and a number of challenges to overcome if it is ever to reach its full deployment potential.

Institutional funding from development banks such as the IMF and World Bank has been around for a long time but will become more important as governments pull back, as will multi-lateral agencies and private finance



Solar: Growth is impressive

The World Energy Council launched its World Energy Resource (WER) study last year. Stating some findings in the specific report on solar, it noted that government incentives for the sector are being gradually scaled back in mature markets, and that there is a need for a new electricity market design and novel methods of project financing in the absence of government support.

Zulandi Van der Westhuizen, Director of Scenarios & Resources at the World Energy Council, says that the impact of reduced government incentives was most evident in markets in Europe and some states in the US.

“The scaling back started several years ago in countries like Spain, Italy, the UK and Germany, with some reducing incentives and others cutting subsidies and government spending,” she says.

While this is a positive signal, since it shows that solar is capable of standing on its own feet, at the same time it discourages investment. According to REN21, a group of government and industry organisations that tracks the industry, investment in renewable energy (wind and solar) in Europe fell from \$120.7 bn in 2011 to \$57.5 billion in 2014.

“There was about a 65% reduction in government incentives paid to UK householders,” notes Van der West-

huizen. “But the most harmful thing was the short timeframe between the announcement of the cuts and the implementation. This created market instability and sent a negative signal [to investors], especially since the nature of energy investment is long term.”

Markets will consequently have to look for methods of financing that are not government-led. In mature countries, market-based models become more significant. In developing countries and rural households, things like consumer finance, leasing and energy service companies are needed.

“Institutional funding from development banks such as the IMF and World Bank has been around for a long time but will become more important as governments pull back, as will multi-lateral agencies and private finance,” adds Van der Westhuizen. “But stable policy is needed to lower investment risk.”

Infrastructure needed

WER Solar 2016 also stated that existing electricity infrastructure, particularly in countries with young markets, could further hinder the expansion of solar capacity.

Existing grid infrastructures have neither the capacity nor flexibility to handle the growing influx of variable renewables such as wind and solar. Germany is a prime example, where heavy energy consuming industries in the south risk shortages since there is insufficient network capacity to transmit wind power from the north.

“Firstly, the grid cannot accommodate additional capacity or loads coming from 10 or 20 different sites at the same time, and secondly, it cannot

handle the instability,” explained Van der Westhuizen.

This means that in most cases, the grid has to be assessed with a view to increasing capacity and to make sure there is back-up support from sources such as gas-fired generation or pumped hydro. Notably, the drive toward greater market integration across countries in Europe will help to promote the sharing of renewable power generation by using grids more effectively.

As markets move into a new area of energy bidding, ancillary services, transmission system access and congestion management, the operation of regional interconnectors becomes crucial.

Reducing grid constraints, says Van der Westhuizen, will also enable more equitable allocation of investment between generation, networks and demand resources.

There has, however, been intense debate over who should be responsible for grid upgrades and expansion. Van der Westhuizen stresses that a way has to be found to enhance the relationship between various system operators. “With all new technologies, the regulatory framework lags behind and is a hindrance,” she says.

Future outlook

The challenges that threaten the expansion of solar will mean that predicting where it will be in the next decade or so will be difficult. Certainly, growth will vary from region to region.

“The more mature markets—where subsidies and incentives are being cut and grids are constrained—will still grow but more slowly,” says Van der

PV will see the biggest growth, simply because it is available in so many applications

Westhuizen. “In developing countries, we might see more utility-scale and bigger projects. Public and new buildings will definitely be growth sectors. Also a lot of big companies are going off-grid, so the market can’t do anything else but grow.”

With many of these off-grid solutions being linked to storage, the rate of solar deployment will also depend on the development of battery storage.

The major opportunities will be in Africa, China, India, parts of Latin America and of course the Middle East. Regarding the Middle East, Van der Westhuizen says: “They have everything that’s needed, and now they also have the appetite for it.”

The technology that is expected to see most growth will continue to be PV, as opposed to concentrated solar power (CSP).

“PV will see the biggest growth, simply because it is available in so many applications,” says Van der Westhuizen. “CSP is starting to come back, slowly but surely. The problem is, it needs more land space and is therefore more expensive. But the advantage is, its utility scale and, with molten salt storage, has much higher efficiencies.”

Last year was a record for renewable capacity increases. The most recent data from the International Renewa-

ble Energy Agency (Irena) shows that Asia saw the highest growth in solar capacity, reaching 139 GW (+50 GW). Almost half of all new solar capacity was installed in China in 2016 (+34 GW). Other countries with significant expansion included: US (+11 GW); Japan (+8 GW) and India (+4 GW). Capacity in Europe expanded by 5 GW to reach 104 GW, with most increases in Germany and the UK.

No doubt solar will continue to see many more years of record growth as costs continue to fall. A project in Abu Dhabi recently bid a record low price of 2.42 cents/kWh for solar electricity. But how much lower they can go is hard to predict.

“Costs have fallen significantly over the last couple of years, mainly due to economies of scale, cheaper materials, etc. Obviously there’s a limit to how much those types of costs can reduce,” says Van der Westhuizen. “What we have to do now is to look at the balance of the costs—the structural system, electrical system and the ‘soft costs’ of system development. These include things like the cost of acquiring customers, permits, labour installation, etc. This is where costs can be cut going forward.”

“There is still room for significant reduction in costs but I don’t think it will be quite as exponential as the last 4-5 years.” ■

The [World Energy Resources report 24th edition](#) covers more than 180 countries and includes 13 individual resources from fossil fuels to renewables and cross cutting technologies with data and analysis.

65%
reduction in government
incentives for UK householders
for solar installation in 2015

The future of LNG

The gas market may be oversupplied now, but in just a few years it could be very different, head of Tellurian Investments tells World Energy Focus

Liquefied natural gas (LNG) buyers may be enjoying abundant supply and cheap prices now but by the middle of the next decade the situation could look very different, the chief executive of Tellurian Investments says.

Charif Souki, the former head of US LNG exporter Cheniere Energy who is now running Tellurian Investments, says the dearth of new projects means the global market will be soon be short 100m tonnes per year of capacity needed to meet demand. It's the basis of his bullish take on the market.

"I'm reasonably certain that all the excess gas will have been absorbed by the end of the decade and we'll be in another price crisis and all the buyers will be complaining," Souki says.

To some of the world's largest LNG buyers, this may seem laughable.

This year global liquefaction capacity is expected to reach 408m tonnes, says Energy Aspects, a consultancy—a 70m-tonne increase from 2015. But LNG imports will be just 261.2m tonnes, a rise of just 15m from 2015.

Much of this new capacity will come from Australia, which could overtake Qatar's 77m tonnes a year of supply to become the world's largest exporter. A few years behind will come the US. Inevitably, LNG prices have been under pressure.

LNG landed in Japan, for example, will sell for about \$5.50 per million British thermal units this year, reckons Energy Aspects, before dropping to around \$4.20/m Btu in 2018. Just two years ago, an exporter could expect to sell a cargo in Asia for almost \$16/m Btu.

But Souki says it's exactly these low prices which are mopping up excess supply. "These very low prices are stimulating demand," Souki says. But countries could still find themselves without enough gas when they need it in the winter.

A longer-term problem that persistently low LNG prices are creating is a lack of investment in infrastructure, Souki says.

"If you don't provide an incentive and a method (for LNG producers) then the infrastructure doesn't get built," Souki says. "All of the producing and selling of gas close by has been done. Now we're left with producing gas and moving it along very long distances either for very expensive pipelines or for liquefaction facilities which are very expensive. There has to be a signal for

408m tonnes
what global liquefaction capacity
of LNG will reach this year



Bullish: Charif Souki, chairman of Tellurian Investments

that to happen and that signal is price."

But the cure for low prices, say producers, is low prices. The weak market now has pushed capital investment in costly new projects off a precipice. That means one thing, says hopeful exporters—an inevitable supply dearth that will force prices higher.

That, say LNG boosters, is exactly where the opportunity is. LNG buyers think the fundamentals are in their favour—and are glad to see the back of contract terms that used to favour exporters, like decades-long contracts pegged to oil prices. Producers need to be more flexible now that power lies with a new breed of importer, they say.

Very low prices are stimulating demand

And that's not going to happen, says Tellurian's Souki, who thinks US gas will sell for \$3/m Btu for the next two decades.

Souki told the Gastech conference in Tokyo in April that he would consider offering LNG from Tellurian's proposed Driftwood project on a five-year fixed price deal at around \$7-8/m Btu. The first train from the project, pending approval, is scheduled to come online in 2022.

Once operational in 2025, the five-train project would have capacity to export 26m t/y of LNG from a terminal on the Calcasieu River, south of Lake Charles in Louisiana.

By then, the dust might have settled on today's collision between buyers and sellers. And Souki's optimistic that the glut will soon pass. ■

Energy diversification is essential for Japan

Public resistance to nuclear power is a hurdle to overcome for Japan to meet its energy targets

Six years on from the Great East Japan Earthquake and Fukushima nuclear accident in Japan, the impact is still being felt in the energy sector.

Of the 42 nuclear reactors in the island nation, 12 have passed safety reviews and three of those are already back in operation, at a total capacity of 2,670MW, while the other nine are being prepared to go back online. However, three out of nine units that were approved will need more time before they can go online.

But two obstacles remain. Once the government has signed them off, the nuclear reactors must still get approval from local authorities—and public opposition remains strong. A recent nationwide survey found almost 60% of the public are still against nuclear power.

Following a lawsuit from local residents, two reactors in Takahama were brought offline just after they had restarted in February 2016. But, in May 2017 the High Court in Osaka overturned the ruling to shut them down.

Such opposition presents a challenge for a nation which has no oil and gas pipelines from neighbouring countries and no natural resources, and which has a self-sufficiency of primary

energy of just 6%.

Teruaki Masumoto, chair of Japan's World Energy Council, says: "More effort is needed to seek people's better understanding of not only risks, but also the importance and benefits of energy, especially nuclear energy. After all, nuclear is an invaluable technology that can create bulky energy without carbon emissions. Of course, safety has to be secured under new regulations."

Most of the public favour renewables over nuclear, and a feed-in-tariff system which was introduced in 2012 caused a rapid penetration of renewables such as mega-solar PVs.

The policy hasn't been a universal success however. In some areas, the total capacity of renewables connected to the grid has become larger than the minimum demand during the day, making it difficult to balance supply and demand.

Japan is the world's largest LNG importer, relying on the fuel for almost 100% of its natural gas supply from more than 15 countries, another consequence of Fukushima—LNG accounted for 30% of Japan's electricity generation in 2010, but that share increased to 42% in 2015. Share of coal is also more than 30%. Diversification of energy

"It is vital for us to utilise what we learned from Fukushima accident for future nuclear safety"

sources is essential for Japan.

Masumoto expects energy imports to fall in the next decade, even as shipments from the US increase. If the six out of nine remaining nuclear reactors which have passed safety reviews come back online as planned, at a total capacity of 9130 MW, that will reduce Japan's LNG demand by about 8.6 million tonnes per year (upper value assuming one-to-one replacement from LNG to nuclear), he says.

While global supply and demand of LNG is increasing, it is not only the changing picture in Japan that will influence southeast Asian LNG prices in the decade to come. How China's economy fares will also have a big influence.

While countries such as China con-



Takahama nuclear reactors three and four

credit: Kansai EPCO

tinue to demand enormous quantities of fuel, Japan's consumption is actually slowing down. It has decreased by 14% in the past decade, with electricity demand down by 10%, a trend which is expected to continue. In part, this has also been a result of Fukushima, as efforts to save energy have been made in the industrial, commercial and household sectors.

A policy known as the Top Runner Programme has seen appliances, cars, other goods and buildings subjected to energy efficiency improvements, and highly efficient goods are now deployed widely. An increase in rooftop solar panels has also contributed.

In addition, the residential power market has been opened up, with

370 companies now competing for customers. Nevertheless, only 5.4% of customers have switched to another provider, mainly in urban settings such as Tokyo, and it is thought the move will have little effect on the overall demand.

As Japan looks towards the future, meeting goals set out in the government's energy mix strategy which was announced in July 2015 will be critical. That mix in 2030 should be 22–24% renewables, 20–22% nuclear, 27% LNG, 26% coal and 3% oil, respectively.

"To achieve this goal, nuclear is a must. And it is vital for us to utilise what we learned from Fukushima accident for future nuclear safety," Masumoto says. ■

2017 Executive Assembly

16 - 19 October 2017, Lisbon, Portugal

The Executive Assembly is the World Energy Council's annual general gathering of the global energy leaders' network. It convenes over 1000 energy leaders, from industry, governments, academia and others for ongoing dialogue on the challenges and opportunities facing the energy sector. Hosted by Portugal, the week-long event will allow for high level, exclusive CEO and Ministerial discussions, peer-to-peer interaction and sharing of best practice.



MEMBER COMMITTEE EVENTS

6th European Energy Forum: What business model for energy in Europe?

22 - 23 May 2017

Paris, France

Digitalisation, the development of variable renewables, new consumers, the emergence of a new governance, the rise of environmental issues and the debate between centralised vs decentralised energy, together with a proliferation of innovation and smart technologies: these are the shakers and drivers of our energy transition. How are new technologies, behaviours and policies going to shape new business models in Europe?

Key Speakers include Jean-Marie Dauger, Co-Chair of the World Energy Council; Olivier Apert, Chair of the Conseil Français de l'Énergie and more energy experts from all over Europe. Organised by the Conseil Français de l'Énergie, the event will be held both in French and English.

For more information, visit the website:

<http://www.wec-france.org/forumEuropeen2017.php>

And register <https://www.inscription-facile.com/form/H8vKf07jDEEtdrXmIKji>

Contact: forum-paris@wec-france.org

Electricity Storage: Accelerating the transition towards smart grids

30 May 2017

Pereira, Colombia

Technological developments in the storage of electricity are booming in response to the rising need to synchronise the supply and demand of energy. The increasing share of intermittent renewable sources for integration in our electricity systems means that storage is the next key challenge in securing reliable energy systems. Storage systems can be of a mechanical, electrochemical, electrostatic / magnetic and chemical nature. With storage

costs expected to lower by 70% by 2030, new technologies such as hydropower by pumping, CAES (Compressed Air Energy Storage), LAES (Liquid Air Energy Storage), flywheels, SNG (Synthetic Natural Gas) hydrogen or batteries are offering opportunities for more efficient smart energy grid systems. Experts from ABB, Schneider Electric, Siemens, University of Pereira and the World Energy Council Colombia will explore such opportunities in a unique event to be held at the Pereira University, Colombia.

For more information and registration, visit:

<http://almacenamientoenergia.energycolombia.org/index.php>

Energy and Geostrategy 2017

Madrid, Spain

11 May 2017

World Energy Council Spain will present the 2017 issue of the "Energy and Geostrategy" report series, published together with the Spanish Institute for Strategic Studies for the fourth time now. Speakers will cover topics such as the Geopolitics of the Renewables, the relationship between Iran and Saudi Arabia, the geostrategic implications of the new US administration energy policy as well as energy geopolitics in the Mediterranean and Latin America. These subjects will be examined in a panel discussion formed by authors and the publication coordinator.

The event is co-organised with the Spanish Ministry of Defense and it is aimed at participants from the public and private sector as well as academia. Registration is possible until 10 May. The 2016 edition is available for download [here](#).

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ABOUT THE WORLD ENERGY 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.

JOIN OUR NETWORK

Join the debate and help influence the energy agenda to promote affordable, stable and environmentally sensitive energy for all. As the world's most influential energy network, the World Energy Council offers you and your organisation the opportunity to participate in the global energy leaders' dialogue. Find out how you can: join a Member Committee; become a Project Partner, Patron or Global Partner; take part in annual industry surveys, study groups and knowledge networks; by visiting our website and contacting our team on: www.worldenergy.org/wec-network

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**WORLD
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ABOUT WORLD ENERGY FOCUS

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