



Crisis and innovation

the most pressing concerns
of the world's energy leaders

The combination of low commodity prices, economic slowdown and the need to innovate to meet climate demands is what is mostly keeping energy leaders awake at night. That is the main outcome of the seventh annual World Energy Issues Monitor of the World Energy Council, a survey of 1200 ministers, CEO's and other top-decision makers from 85 countries. Interestingly, energy leaders in China – a special focus of this year's Monitor – are concerned most of all with innovation challenges, such as electric storage, smart grids and energy efficiency.

The new World Energy Issues Monitor (WEIM), one of the World Energy Council's flagship publications, makes it clear that energy companies across

the world find themselves hit by a triple challenge, says Christoph Frei, Secretary-General of the Council. "The position many companies find

themselves in is that there is no growth and low prices, so they have little capital to invest in innovation, just at a time when they need it most."

The decarbonisation agenda makes "opting out on innovation not an option", says Frei. "If you're not part of the new energy world, you won't survive." Hence the title of the new Monitor, which will be published later this month: *"A Climate of Innovation: Responding to the Commodity Price Storm"*.

Wind farm in China. Photo Asian Development Bank

EXCELLENT PICTURE

For seven years now, the World Energy Council has been surveying a growing group of the highest-level energy decision makers from all parts of the world about their most pressing concerns. This results in a unique overview of the issues that "keep energy leaders awake at night" (issues with high impact and high uncertainty), that "keep them busy at work" (high impact, low uncertainty), or that they find of less urgency.

"The Issues Monitor helps us define the agenda of our national, regional and global conferences", says Frei, who pioneered this project when he joined the World Energy Council in 2009. "Together with the Energy Trilemma Index [<http://bit.ly/1Ta5pSAJ>], the Issues Monitor is one of the two tools helping to inform my discussions with people in the energy sector around the world. They give me an excellent picture of the most urgent issues and the policy weaknesses that need to be addressed."

According to Frei, energy executives tend to find the Issues Monitor highly valuable to test their own thinking against that of their peers. "Many have said to me that they use the Monitor in their board meetings and to see whether they are missing out on important issues. > see page 2

INTERVIEW

Jeannot Gamanda, Energy Minister Democratic Republic of Congo

Despite a huge energy production potential, the Democratic Republic of Congo (DRC) is suffering from a substantial energy deficit. But this is about to change: the government has ambitious plans to turn the country into an energy powerhouse, explains Jeannot Matadi Nenga Gamanda, DRC Minister for Energy and Water Resources, in an exclusive interview.

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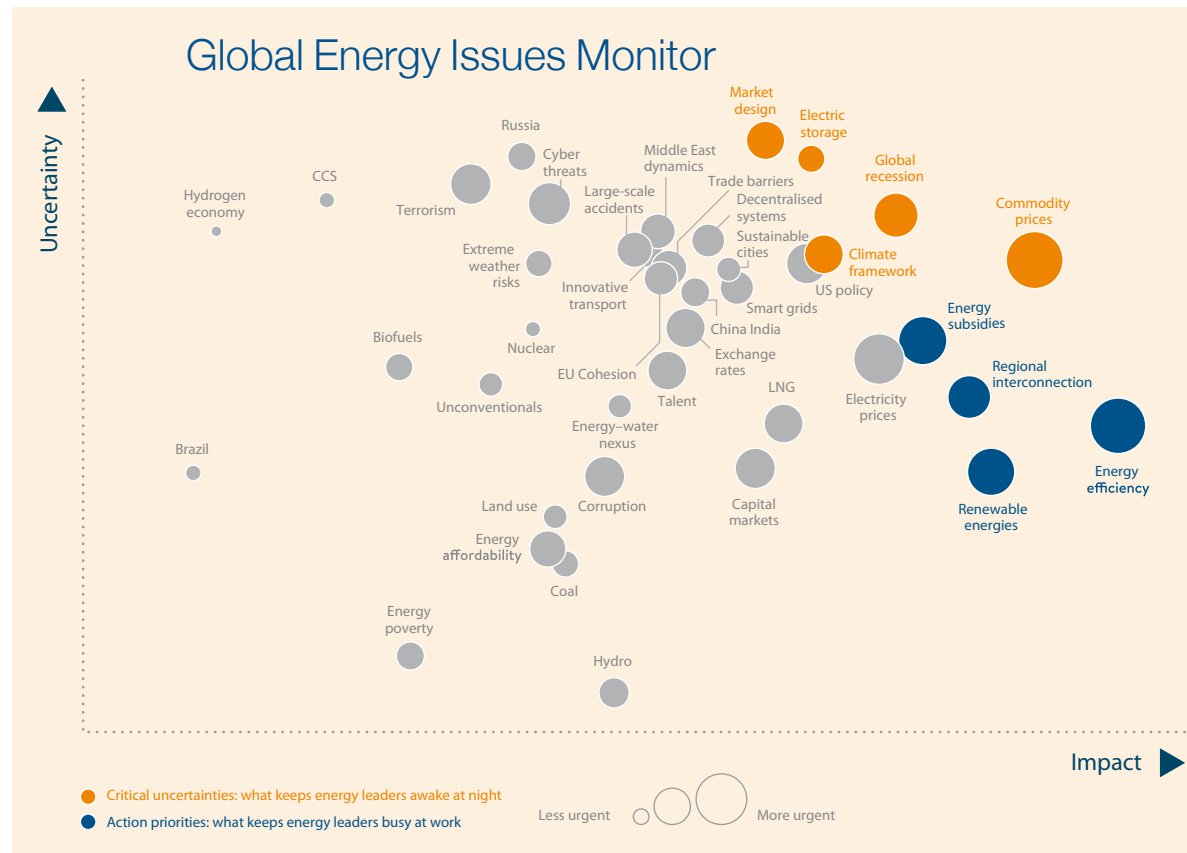
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HIGHEST IMPACT

Frei says that over time there are roughly some 40 key issues that define the global energy agenda. “They tend to be fairly stable. So each new edition of the Monitor clearly points up the changes that are taking place in people’s concerns as well as the regional differences that exist.”

In addition to the concerns around *commodity prices*, *recession* and

climate, this year’s Monitor shows that *e-storage* and market design are the two issues associated with the highest uncertainty level that also have a fairly high impact. *Energy efficiency*, *renewable energies*, *regional interconnection* and *energy subsidies* are all regarded as having the highest impact, but not such high uncertainty.

OFF THE MAP

The Monitor also reveals which issues are *not* of pressing concern to energy leaders. *Carbon capture and storage* (CCS), for example, “is flying off the map”, says Frei. “It is not seen by energy leaders as a technology that can make a difference in the current circumstances, regrettable though this may be.” CCS faces huge challenges that are nowhere near being solved, notes Frei. “It pushes up costs 10-20%, reduces energy

efficiency 10-15%, which goes against the trend we need, and it also increases the need for water. Availability of water is a growing concern in the world and the water footprint of coal-fired power is already very high.”

Nuclear power is also not generally viewed as a high-priority issue, notes Frei. “In terms of entry barriers, nuclear is the polar opposite of renewable energy, especially solar power. Anyone can put a solar panel on their roof, but building a new nuclear plant is only possible with very strong long-term commitment from policymakers. That’s a massive investment barrier for the nuclear sector.”

The low priority given to nuclear power, CCS and also biofuels could be a signal for policymakers to take action, says Frei. “The world is moving to decarbonisation at 1% per year. But to keep global warming within the 2 degree limit, we need to get to 4% per year. To get there we need all the technologies that are available to us.”

CHINESE ISSUES

This year’s Issues Monitor for the first time includes a special section on China. The World Energy Council partnered with the National Development and Reform Commission (NDRC) and its Energy Research Institute. “We are very proud of this cooperation”, says Frei. “The Energy Research Institute gave us access to the top energy leaders in China.”

China’s Issues Monitor reveals that energy decision-makers in China

have somewhat different concerns than their counterparts elsewhere. *Electric storage*, *smart grids* and *climate framework* are the main ‘critical uncertainties’ for the Chinese (what

“Chinese energy
leaders are
totally committed to
innovation”

keeps them awake), whereas *energy efficiency*, *coal* and *renewable energies* are their major ‘action priorities’ (what keeps them busy).

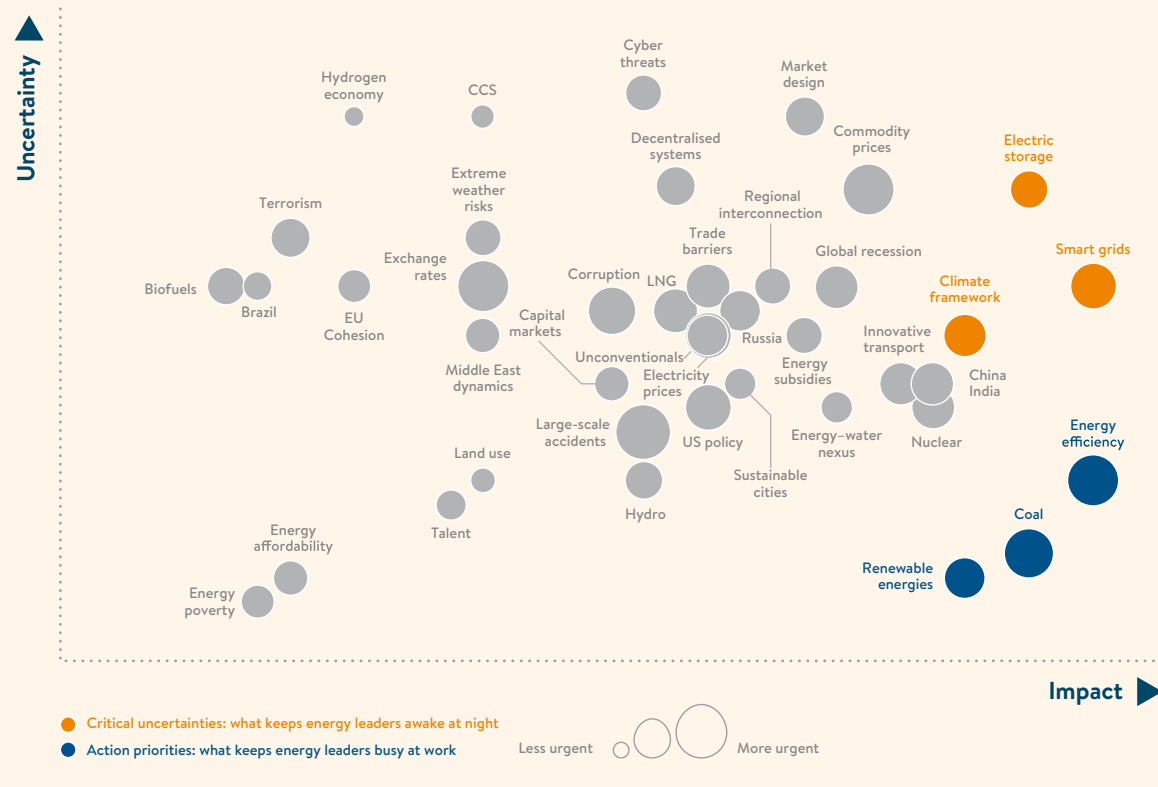
Frei: “Chinese energy leaders are focused most of all on typical innovation issues, such as storage, market design, new forms of transport. They put a lot of effort into understanding and developing innovation. They are totally committed to that. But coal is also still a centrepiece for them. It is still the basis of their energy system.”

CRITICAL THRESHOLD

Although China over the last few years built by far the largest amounts of solar and wind power in the world [<http://bit.ly/1UvGc4m>], in terms of market share renewables in China are still lagging behind those in countries like Germany. Renewables currently account for almost 5% of China’s > [see page 3](#)

ADVERTISEMENT

China Energy Issues Monitor



electricity generation, in the EU this is about 29% [<http://bit.ly/1ZY4mE2>].

This is why the Chinese are highly interested in learning how Europe copes with its renewable energy sector, says Frei. "Once you pass a certain critical threshold of intermittent renewables, your market design needs to meet very different requirements. You get into issues like storage, grid connections,

demand response, backup power. This is where Europe is leading."

By contrast, where China may be ahead, is in the urban segment, particularly in the development of electric vehicles, says Frei. "It's still an open question whether Tesla or BYD may come to dominate this market."

But what is clear from the Issues Monitor is that the world is now definitely set on a course towards decarbonisation. "At the World Energy Congress in Daegu in 2013, we said we may be approaching a tipping point", notes Frei. "Now we have gone past it. Renewable energy, energy efficiency, smart grids, electric storage, the climate framework – they are all top of the agenda – and they are here to stay." ●

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Interview Jeannot Gamanda,
Energy Minister
Democratic Republic of Congo

“We will make
DRC an African energy
superpower by 2030”

Despite a huge energy production potential, the Democratic Republic of Congo (DRC) is suffering from a substantial energy deficit. Only 15% of people are connected to the grid and mining is curtailed because of lack of electricity. But this is about to change: the DRC government has ambitious plans to turn the country into an energy powerhouse. Jeannot Matadi Nenga Gamanda, DRC Minister for Energy and Water Resources, explains the plans in an exclusive interview with World Energy Focus.

The energy production potential of the Democratic Republic of Congo (DRC) has always been seen as extraordinary and unique in Africa: 100,000 MW, of which 44,000 MW from the Inga hydropower site alone on the river Congo. This potential could serve not only the country itself, but the entire region and indeed the continent.

Yet DRC actually has a huge energy deficit. Its energy infrastructure is old and overused. Almost half of the generation fleet is unavailable. But Jeannot Gamanda, the Congolese Energy Minister, is “determined to radically change the current situation”, with the aid of private and international capital – and domestic companies. His Ministry has created a dedicated

*Flying over Inga Dam.
Photo USAID*

unit for the development of mid-sized hydropower plants and is developing the huge Inga site as well as distributed solar power and a limited number of fossil fuel plants.

What is the role of energy in your country's growth and development?

Energy will generate important revenues for DRC, as well as leveraging the development of other economic sectors. For example, just the operation of the Inga 3 dam could net the state around \$500 million a year. Already, in spite of its fragile cash-flow, the ex-monopoly Société Nationale d'Electricité (national electricity company) brings in \$0.5 million a year in taxes, plus \$2 million a month from power invoiced to public institutions.

But copper production in Katanga for example, is currently limited to 800,000 tonnes a year because of a lack of electricity; the potential is 1.5 million tonnes.

We are therefore determined to radically change the current situation by making the electricity sector a major pillar of the country's reconstruction policy and the re-launch of its economy. With this in mind, the sector offers great investment opportunities. With its many energy resources, DRC not only has the potential to satisfy its own needs, but also aspires to play a key role in feeding other African regions

with energy. We will make DRC an African energy superpower by 2030.

How will you fulfill that goal?

Today, there is a huge gap between the exploitable potential and the proportion of the population with electricity access: that's only 15.4% on average – and just 1% in rural areas. We want to raise this to 18% by 2018 and 32% by 2030.

To do that, we have to put to work all of our existing installed capacity (2,500 MW) by rehabilitating, modernising and extending existing installations. In addition, the share of non-hydro renewable energy sources – we have abundant biomass, but I am talking here especially about solar power – will represent 15% of our national electricity production by 2030. We also have some fossil fuel projects: a flaring gas-fired plant in Moanda (2x150 MW), a coal-fired power plant in Luana (2x150 MW) and a power plant fed by methane from Kivu Lake (4x25 MW). Despite their significant potential however, we don't plan to go all out on fossil fuels because they could cause us problems, notably when it comes to the environment.

This sounds like an expensive programme.

Of course, these efforts will require a lot of investment: around \$6.5 billion for the rehabilitation and construction of new power plants plus related grid infrastructure to make up for the current energy deficit, and \$22 billion from now to 2030 to meet the expected future demand.

To help raise the money needed, we have created a dedicated unit for the development of mid-size hydropower plants within my Ministry. It is directly under my authority and its purpose is to fulfil a programme for the study and development of mid-size plants agreed

“We are determined
to radically change
the current situation”

with our development partners. The World Bank has already committed to contribute funds in the form of grants. We are pursuing those negotiations. The African Development Bank has never refused us anything as long as a project is bankable.

But first and foremost, we are counting on our government to invest in the energy sector, because without energy there is no industry and therefore no jobs and no development. Policy decisions are therefore crucial. Second, we of course count on our usual partners and they are aware of it. I doubt they would refrain from helping a country with such legendary clean energy potential, which can double up as a gateway to helping Africa as a whole.

Some 247 hydropower sites have been identified in DRC. How do you intend to exploit this potential?

Through the construction of new mid-size hydropower [> see page 5](#)

plants, financed by the government, our partners or both. But this is not only about building new plants: we want to retrofit old ones, such as Nzilo (120 MW) and Busanga (230 MW) in Katanga. The electricity sector needs two fundamental things: time and money. The State can no longer afford a monopoly. We have to open the energy sector to private investors with or without public-private partnerships. The electricity law of 17 June 2014 has therefore kicked off the liberalisation of electricity generation, transmission and distribution.

DRC has difficulties paying its share in the hydropower projects at Zongo II (co-financed by China), and Katende and Kakobola (co-financed by India). How do you intend to restore confidence from foreign investors in this regard?

These power plants are now two years behind schedule, but today the State regularly pays its share, which we have decided to do in instalments. The works at Katende (64 MW), which should be finished by December 2017, are 55% complete. The construction of the Kakobola plant (10.5 MW) is slow and expensive. These works are due to finish in March 2016, but we still have to build grid connections to supply Kirwit, Idiofa and Gungu, which will delay the start of the power plant. As far as Zongo II (150 MW) is concerned, Sinohydro has resumed works after six months of interruption because here too, the State is now paying its share. Construction is 80% complete and should be finished by

July 2017, including the associated grid connections. Zongo's problems have come from additional works that have brought additional costs.

I have other examples of successful international cooperation. The Matebe plant (12.6 MW) in the Virunga area for example, was inaugurated on 15 December 2015 and is already operational. This plant was built thanks to the EU and the Buffet Foundation. In the same vein, we are building the Mitwanga plant (440 kW). The EU and Virunga SA [a private company] plan to build other power plants to protect Virunga National Park and bring light to the region, with up to a total of 97 MW capacity. Finally, DRC and Zambia expect to lay the first stone of the Luapula hydropower plant (700 MW) soon because the feasibility studies are complete.

**"The State
can no longer afford
a monopoly"**

The search for foreign partnerships is not always a given however, because thanks to liberalisation, companies already active in DRC and even Congolese companies themselves, are showing interest: Kipay Investissement for example, has committed itself to



Jeannot Matadi Nenga Gamanda

hydropower projects at Sombwe (90 MW) and Kawa (29 MW) in Katanga, and STS has committed itself in Tshikapa and North Kivu.

The iconic Inga project has encountered fresh delays. Where do we stand with this today, especially in the negotiations with South Africa?

The studies undertaken for the development of this potentially gigantic hydropower site of 44,000 MW propose a six-phase deployment, on top of the two dams already in operation, to create a single dam covering the whole width of the Congo River.

First, we will build Inga 3: 4,800 MW with Inga 3 "Low Fall", then 7,800 MW with Inga 3 "High Fall" (by raising the height of the dam). Then come Inga's 4 to 8, in line with demand from national industry and other African countries. We are currently working on the Inga 3 "Low Fall" project. Three foreign consortia were short-listed after the pre-qualification phase. We cannot predict at this stage therefore, who will be the

main promoter-investor. One thing is sure: the project will be developed through a public-private partnership, with the participation of multilateral financial institutions. As for power tariff, it will only be known once the current additional studies and final business plan are completed. First indications are very favourable, however.

Let's come back to DRC's solar potential. How will you exploit that?

The country is well located, so there is enormous potential: the average sunshine in a year is 3.34-6.73 kWh/m², whereas the minimal threshold to generate electricity by PV is 1 kWh/m². We will develop the sector in particular to supply Katanga's mining companies with power. This is urgent because their power supply deficit is reaching 700 MW. Some companies have already shown interest. And yet we cannot afford to systematically turn to PV because of its price.

Not long ago, it cost \$0.12-0.15/kWh. Even if some propose \$0.07-0.10/kWh, our rural populations cannot afford it. We have however, launched feasibility studies for a programme aimed at bringing electricity into pilot villages through hydro or PV. Close to Kinshasa, one pilot village, Mboka Polo, is being electrified through PV for example. Other solar power projects are underway at Kolwezi (50 MW), Likasi (50 MW), Lubumbashi (20 MW), Goma (30 MW), Mbandaka (5 MW) and Kasaji (1 MW). We are currently electrifying other provincial capitals too, through PV. We will succeed. ●

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BP Energy Outlook confirms major global energy trends



Energy consumption continues to rise - busy in Bangalore, India. Photo Ryan

Global demand for energy continues to rise, the fuel mix continues to change with renewables gaining, coal losing and oil and gas holding steady, and the growth rate of carbon emissions continues to slow sharply, but not enough. These three major conclusions from BP's 2016 Energy Outlook [<http://on.bp.com/1SGMKOh>] are not a great surprise, but they do confirm the main trends taking place across the global energy industry.

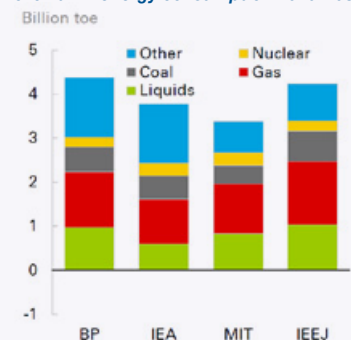
BP's annual outlook, which projects trends 20 years into the future, is broadly aligned with other major outlooks, such as those from the International Energy Agency (IEA), MIT and the Institute of Energy Economics of Japan (IEEJ). Most of the growth in energy consumption will take place in natural gas and renewables, yet coal, oil and nuclear will also grow, reports BP.

According to the BP 2016 Energy Outlook, gas will overtake coal in the energy mix, showing cumulative growth of 44% over 2014-2035 – more than the current gas production of Russia and the US combined.

Some other interesting conclusions from the BP report:

- The US will achieve overall energy self-sufficiency by 2021 and oil self-sufficiency by 2030.
- China will surpass the US as the leading oil consumer by 2035, but per capita oil consumption will remain just 27% of that of the US.
- China will add more renewable power over the next 20 years than the EU and US combined. ●

Growth in energy consumption 2010-2030



Source: BP

	Growth 2014-35 (p.a.)	Growth 2014-35 (cumulative)	2014 (share)	2035 (share)
Primary energy	1.4%	34%	100%	100%
Oil	0.9%	20%	32%	29%
Gas	1.8%	44%	24%	26%
Coal	0.5%	10%	30%	25%
Nuclear	1.9%	50%	4%	5%
Hydro	1.8%	45%	7%	7%
Renewables*	6.6%	285%	3%	9%
Population	0.9%	21%		
GDP (\$2010 PPP)	3.5%	107%		
Energy Intensity	-2.1%	-35%		
CO ₂ emissions	0.9%	20%		

* Includes biofuels

Source: BP

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Electric vehicles - how big will they become?

The electric vehicle (EV) revolution could turn out to be more dramatic than governments and oil companies have yet realised. Further, big reductions in battery prices lie ahead and during the 2020s EVs will become a more economic option than gasoline or diesel cars in most countries, according to new research from Bloomberg New Energy Finance (BNEF).

The BNEF study, published on 25 February, forecasts that sales of electric vehicles will hit 41 million by 2040, representing 35% of new light duty vehicle sales. This would be almost 90 times the equivalent figure for 2015, when EV sales are estimated to have been 462,000, some 60% up on 2014.

This projected change between now and 2040 will have implications beyond the car market. The research estimates that the growth of EVs will mean they represent a quarter of the cars on the road by that date, displacing 13 million

barrels per day of crude oil (some 15% of global oil production), but using 1,900TWh of electricity, equivalent to nearly 8% of global electricity demand in 2015.

The study is based on a crude oil price recovering to \$50 and rising to \$70 by 2040, but even if the oil price were to fall to \$20 and stay there, this would only delay mass adoption of EVs to the early 2030.

The outcome of the BNEF report contrasts starkly with some of the projections from major oil companies.

ExxonMobil in its Outlook for Energy [<http://exxonmobil.co/1hOSCCa>]:

A View to 2040, published in December 2015, expects that “plug-in hybrids and fully electric cars are likely to account for less than 10 percent of new-car sales globally in 2040”, i.e. less than a third of what BNEF predicts.

BP in its 2016 Energy Outlook does not quantify the uptake of EVs, but notes that oil will still account for 88% of transport fuel in 2035, with the remaining 12% mostly biofuels and natural gas. Electricity will only supply a fraction of transport fuel in this projection. Likewise, the International Energy Agency (IEA), in its World Energy Outlook (p. 306), published in November last year, forecasts 270 TWh of consumption from electric transport in 2040 in its central scenario, i.e. only about one-seventh of the BNEF projection. ●

Methane emissions in US revised upwards

Natural gas is seen by many as the ideal bridge to a decarbonised energy system. It is abundant, affordable and has a relatively low CO₂-impact, so the industry story goes. One problem, though, is that production and transport of gas also leads to emissions of methane, which is 35 times as powerful a greenhouse gas as CO₂ (over the span of a century). It is not clear, however, how large worldwide methane emissions are.

The US government under president Obama has been active for a number of years now in researching the problem

and taking preventive measures. The latest research [<http://1.usa.gov/1Rw8Sox>] from the US Environmental Protection Agency (EPA) is not very reassuring, however. Releasing new data in February, the EPA has revised estimates of methane emissions from the US oil and gas industry upwards by 27%. Over a 20-year period, the emissions have the same climate impact as 200 coal-fired power plants.

What is more, new research [<http://bit.ly/1ouDcZN>] by Harvard scientists, also published in February, shows

that US methane emissions are actually considerably higher [<http://bit.ly/1PGROhJ>] than the official numbers from the EPA. The Harvard study is based on actual satellite data and surface observations, unlike the EPA's numbers, which are provided by the industry. According to the observations, there was a huge spike in human-caused methane emissions in recent years, probably attributable to the shale gas revolution in the US.

If gas is to be instrumental in the energy transition, more needs to be done to reduce emissions, lead author Alex Turner concludes. ●

China's stunning energy transformation

Air pollution in Henan Province December 2013. Photo V.T. Polywoda

Coal consumption in China fell 3.7% last year, leading to speculation that Chinese CO₂ emissions have already peaked, 15 years before the 2030 target peak date which the Chinese government has set. But not everyone is convinced that coal will continue to decline.

The official energy statistics from the Chinese National Bureau of Statistics, published on 29 February [available in Mandarin <http://bit.ly/1TSMsDR>], are staggering. China achieved two clean energy world records last year: one for installing 32.5 GW of wind energy, another for installing 18.3 GW of solar power.

At the same time, coal consumption declined 3.7%, consumption of natural gas grew 3.3%, oil consumption rose 5.6%, and the energy intensity of China's economy fell by 5.6%. Add to

this strong growth of nuclear power (+30%, 6 GW added) and hydro (+4.9%, +15GW) and it is clear that China's energy mix is undergoing a drastic transformation.

Dr Yang Fuqiang, Senior Advisor of the Natural Resources Defense Council (NRDC), has calculated from these official numbers that China's CO₂-emissions must have declined in 2015 compared to 2014. He believes that it is possible for China to achieve further declines in the coming years, implying

Year end December [TWh]	2014	2015	% Chg	TWh Chg	% share 2014	% share 2015
Thermal generation	4,359.7	4,242.0	-2.7%	-117.7%	75.3%	73.0%
Hydro generation	1,072.8	1,126.4	5.0%	53.6%	189.5%	19.4%
Nuclear generation	132.5	170.8	28.9%	38.3	2.3%	2.9%
Renewable generation	228.2	271.4	18.9%	43.2	3.9%	4.7%
Total generation [TWh]	5,793.2	5,810.6	0.3%	17.4	100.0%	100.0%

Source: IEEFA (Institute for Energy Economics and Financial Analysis), based on data from China's National Bureau of Statistics

that 2014 would turn out to be the peak year for emissions. The Chinese government has made a commitment to start reducing greenhouse gas emissions from 2030 on.

Not everyone is equally optimistic. Professor Boqiang Lin, Dean of the Institute for Studies in Energy Policy at Xiamen University, believes that "China's demand for coal is likely to recover once the economy turns for the better and energy demand rebounds."

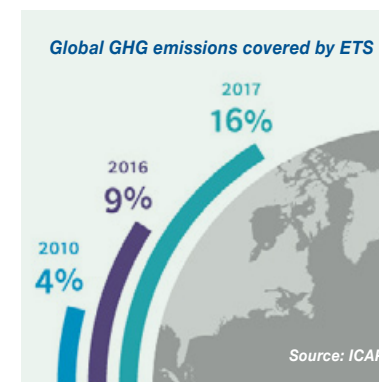
Despite China's impressive expansion of renewables, the country still relies heavily on coal for its energy use: Professor Lin notes that "even if the total energy consumption growth rate is zero, to replace 1% coal consumption requires 10% growth in clean energy in China." ●

Article based on sources made available by the European Climate Foundation and the Institute for Energy Economics and Financial Analysis.

Emissions Trading Systems spreading

Last year saw the announcement of five new Emission Trading Systems (ETS) in Asia and North America, bringing the total worldwide to 17, according to research [<http://bit.ly/1Rq9hLO>] from the International Carbon Action Partnership (ICAP). The current schemes cover over four billion tons of greenhouse gas emissions, some 9% of the world total. ICAP expects the systems to grow further to 17% by 2017.

2015 saw Asia emerge as the new hotspot for emissions trading, with nine new systems launched in the past three years, including of the Republic of Korea at the beginning of the year. This strong growth is set to continue with the announcement of a national ETS in China for 2017, which would make it the largest single carbon market in the world. Tokyo has a unique city-wide cap-and-trade programme.



The Canadian provinces of Manitoba and Ontario both announced plans to implement an ETS, implying the Western Climate Initiative carbon market of California and Québec is set to expand even further.

CO₂-prices in 2014 and 2015 ranged from as low as \$2 per tonne in Chinese pilot projects to over \$13 per tonne in California and Québec. ●

NEWS IN BRIEF

PAKISTAN ATTRACTS RENEWABLES INVESTMENT

Pakistan continues to draw interest from investors looking to set up renewable energy projects. Danish wind turbine manufacturer Vestas has announced plans to build 1 GW of wind capacity in the Punjab province. China is expected to invest around \$500 million in renewable energy projects in Pakistan, as part of the \$45 billion agreement between the two countries to build infrastructure projects in Pakistan (China-Pakistan Economic Corridor).

SOLAR PV HITS RECORD LOW PRICES

Unsubsidised solar PV has hit a record low price in an auction in Peru, reports CleanTechnica [<http://bit.ly/1QNH7qX>]. The country recently awarded 144 MW of new solar PV contracts to Enel Green Power at \$47.98/MWh and 40 MW to Enersur at \$48.50/MWh. Until recently, Abu Dhabi and Saudi Arabia had achieved the lowest prices in the world.

OIL MARKET TO "REBALANCE"– AND SPIKE

Global oil supply growth is plunging as a result of drastic cutbacks in investment, the International Energy Agency (IEA) reports in its Medium-Term Oil Market Report 2016 [<http://bit.ly/24De5EI>], published on 22 February. The IEA expects that the market will begin "rebalancing" in 2017, but warns that this may be followed by a new oil price spike towards 2020, as demand will continue to grow and supply will drop.

Estonia harnesses old energy to embrace the new



Electric car charging in Estonia. Photo Joao Rei

Old and new energy technologies meet in Estonia, a Baltic state at the crossroads of three large power markets – Nordic, Russian and Central European. Oil shale has provided most of the country's power for the past one hundred years, and with modernised production techniques it will continue to be important and even offer export opportunities. At the same time Estonia is the number one in the world in smart meter apps and electric vehicle charging points.

Estonia has long relied on relatively dirty oil shale, which today still makes up almost 75% of the country's total primary energy production. Yet penetration of renewables is increasing (now 15% biomass and wind, with 9% dependence on gas). The Estonian government is soon likely to approve a new energy development plan (National Development Plan of the Energy Sector Until 2030) [<http://bit.ly/1QNzJMa>], which aims at decreasing CO₂ emissions by 70% by 2030, with targets of renewables penetration at 45% of final energy consumption and 28% of primary energy consumption by 2030.

Lower CO₂ emissions will not only come from renewables, however. The country's largest power company Eesti

Energia (Enefit outside Estonia) has been piloting a new generation of shale oil power plants, the first of which was commissioned in 2015, with more than double the efficiency compared to older plants. "Through cogeneration of oil, gas and power, we can halve our CO₂ emissions", says Hando Sutter, Chief Executive of Eesti Energia.

In this cogeneration process, oil shale is heated, releasing gas, which is used to generate electricity, and shale oil, which is sent to refineries. Eesti is also developing capacities to purify heavy fuel oil and extract gasoline from retort gas, notes Margus Vals, Board Member of Eesti Energia and Chairman of the World Energy Council's Estonian member committee.

Estonia's long experience with combustion of high-carbon oil shale for electricity generation is even providing export opportunities for the country. In 2011 Eesti Energia bought a large oil shale deposit in the US state of Utah, which the company believes contains 2.6 billion barrels of recoverable oil. A €640 million combined oil shale and biomass power plant is under construction in Narva, near the Russian border. And the company is "in the final stages of financing an oil shale project in Jordan to construct a 554 MW power plant with an open cast mine", says Vals. "Once finalized, this will be our first successful oil shale know-how export. As oil shale is a vast global resource, we are seeing interest from other countries as well."

GET SMART

Meanwhile Estonians are wholeheartedly embracing new and renewable energy technologies. By the end of 2016 Estonia will be the first country in the world with installed hourly metering for all electricity consumers. Mikkel Härm, Secretary General of the Estonian member committee, explains: "Having smart meters will help create a highly competitive electricity market. Smart meters gather hourly consumption data which can then be easily sent to each seller of electricity, removing entry barriers into the power market."

The smart meter roll-out is also expected to lead to gains in energy efficiency and a flatter demand pattern throughout the day. The expectation is

that if consumers are aware of the actual cost of power, they will be motivated to shift their consumption to hours at which the price of electricity is lower.

Härm says, "consumers don't even have to look at the meters any more, the consumption data is sent automatically to the grid operator who then sends the data to electricity sellers. Consumers who want to feel more engaged can download an app [<http://bit.ly/1L6n0s6>] to their phone and see the current consumption, hourly prices, and their past consumption on their phone."

Estonia is also one of the first countries in the world to have a nationwide charging station network for electric vehicles (EVs). Today, 1% of small cars run on electricity - the second highest share in the world after Norway. Härm cites the Estonian national character as a factor in the enthusiastic take-up of EVs. "Estonian people are very open to innovation and always want to be the first ones to have a new technology. People here embrace the internet and mobile banking, e-government services, and smart meters for electricity."

CROSSROADS OF POWER

Situated at the crossroads of three large power markets – Nordic, Russian and Central European – Estonia is one of the most interconnected countries in the world. One 330 kV line links to Russia and two lines of the same capacity to Latvia. Since 2006, the direct current network, EstLink 1 (capacity 350 MW), connects Estonia with Finland. In 2014 Estlink 2 brought

total capacity between Estonia and Finland up to 1000 MW.

Härm notes, "Interconnection capacity is twice that of peak demand in Estonia. We are one of the few exporters of electricity in the region, because our oil shale-based power generation is very competitive. The only producers that can provide cheaper electricity are subsidised renewables."

This could change if CO₂ prices in the EU were to go up, as expected. In the neighbouring Russian power market, there is no CO₂ price, making Estonian power producers potentially vulnerable to competition from cheaper Russian sources. Härm says, "There aren't currently any concrete plans how to deal with this issue. Our position is that the solution should be pan-European, otherwise it won't work."

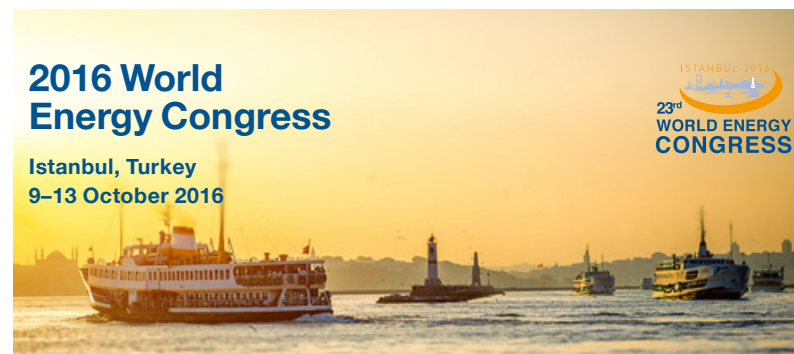
Eesti Energia is keen to meet the challenge of decarbonising energy production. "The greatest challenge is transforming our mainly fossil fuel based energy system into one that would still be able to provide energy security - but would be based on renewables", says Härm. "Estonia is rich in biomass which means that we can build up an affordable and environmentally friendly power sector where the main generators are flexible and available on demand. We see Estonia as becoming a blueprint for sustainable and affordable energy systems. We are trying to achieve the same things as Germany, but still keep it affordable for Estonian consumers." ●

World Energy Leaders' Dialogue**Beijing, China****11 March**

This high-level, invitation-only event provides a crucial platform for the global energy leaders' community to facilitate dialogue on critical issues affecting the energy world. It highlights insights gained from the 2016 edition of the World Energy Issues Monitor and the World Energy Scenarios 2060, as well as sessions exploring

China's energy outlook by 2060 and the challenges and outlook for global governance in energy.

It will be jointly co-hosted with the support of the Energy Research Institute (ERI) of the National Development and Reform Commission of the People's Republic of China and the China Overseas Development Association (CODA), with the endorsement of the Council's Chinese Member Committee.



With only 8 months remaining until the 23rd World Energy Congress kicks off in Istanbul under the theme "Embracing New Frontiers", the 150th speaker has been announced. Confirmed speakers come from 58 countries and include 24 Ministers so far.

The triennial World Energy Congress has gained recognition since the first event in 1923 as the premier global forum for leaders and thinkers to debate solutions to energy issues. In addition to the discussions, the event provides an opportunity for executives to display

their technologies and explore business opportunities.

Companies interested in sponsoring the Congress are welcome to contact the appointed marketing consultants from ITE Group plc, vivian.linecar@ite-events.com.

For more information not only on sponsorship, but also on the Congress, the call for papers, and registration visit **the official congress website** <http://www.wec2016istanbul.org.tr/> Follow the Congress on **Twitter**: <https://twitter.com/WECongress>

MEMBER COMMITTEE EVENTS

Myths and Challenges of Renewable Energies**Bogotá, Colombia****10 March 2016**

COP 21 presented a vision of the future where renewable resources will be key to meeting the agreed climate targets. How competitive can renewable energy sources be, are they as expensive as we think? What are the success stories where renewable energy has contributed to reliability and security of supply? What regulatory mechanisms incentivise investment in renewables? What are the biggest barriers to finance projects? These are only some of the questions experts from government, finance and industry will explore. Registration is free for this conference organised by the World Energy Council Colombia Member committee.

Contact: Daniel Diaz Toro
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Website: <http://mitosrenovables.cocme.org/>

Asia-Pacific Energy Leaders' Summit**Wellington, New Zealand****16-17 March 2016**

The Leaders' 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.

Contact: John Carnegie
E-mail: jcarnegie@businessnz.org.nz
Website: <http://www.bec.org.nz/summit>

Natural Resources Management: Current Challenges**Rennes, France****24-25 March 2016**

The main objective of this workshop is to analyse the impact of climate change as well as of conflicts and terrorism on natural resources. The French Member committee of the World Energy Council partnered for this with the French Association of Environmental and Resource Economists (FAERE) to ensure that they both benefit from the insights. Participants will also evaluate the relationship between poverty, inequality and natural resources as well as the commoditisation of energy markets and price volatility. The event will be conducted in French and English.
Contact: Marie-Hélène Hubert
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SEE MORE COUNCIL EVENTS AT
www.worldenergy.org/events/future

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.

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: <http://www.worldenergy.org/wec-network>

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