



Business models

For the grand transition

The Mexico case
Applying future
scenarios

Interview
The energy analyst
now selling solar

Country Focus
New Zealand's
going places

Renewables on the rise
Wind and solar set to soar

Solar PV growth outpaces all other fuels — and will continue to grow

Renewables broke new records in 2016, largely as a result of booming solar photovoltaics (PV) deployed in the People's Republic of China, according to the International Energy Agency (IEA)

According to the IEA's report *Renewables 2017: Analysis and Forecast to 2022*, renewables deployment, driven by sharp cost reductions and policy support, represented almost two-thirds of new net electricity capacity additions in 2016, with almost 165 GW coming online. This was accompanied by record-low auction prices as low as \$30/MWh, said the IEA.

This year's renewable forecast is 12% higher than last year, thanks mostly to solar PV upward revisions in China and India. Three countries — China, India and the United States — will account for two-thirds of global renewable expansion by 2022. Total solar PV capacity by then would exceed the combined power capacities of India and Japan today.

"We see renewables growing by about 1000 GW by 2022, which equals about half of the current global capacity in coal power, which took 80 years to build," said Dr Fatih Birol, the executive director of the IEA. "What we are witnessing is the birth of a new era in solar PV. We expect that solar PV capacity growth

will be higher than any other renewable technology through 2022."

Paolo Frankl, head of the IEA's Renewable Energy Division, said: "The real star is solar PV. Last year, new solar PV capacity around the world grew by 50%, reaching over 74 GW, with China accounting for almost half of this expansion. For the first time, solar PV additions rose faster than any other fuel, surpassing the net growth in coal."

Meanwhile, annual capacity growth of wind declined by almost one-fifth in 2016, following the 2015 boom caused by a developer rush in China. Hydropower capacity expansion was lower than in 2015, as the Chinese market declined for a third year in a row, while Brazil saw strong growth. The growth of other renewable technologies such as bioenergy, concentrating solar power (CSP), and geothermal was relatively slow, and it represented only 4% of 2016 global renewable capacity additions.

Although renewables have been a huge success story, the report notes that challenges remain in their

deployment in the transport and heat sectors.

The share of renewables in road transport fuel is expected to increase only marginally, from 4% in 2016 to almost 5% in 2022. "Despite the surge in electric vehicles, decarbonisation of the transport sector remains a major policy challenge. We see an important opportunity in the new advanced biofuels technologies — those based on non-edible feedstock... but without specific policy incentives, this industry cannot grow," said Frankl.

The share of renewables in heat consumption will increase slowly, from 9% in 2015 to almost 11% in 2022. "For heat, we have mixed signals," notes Frankl. "There is an increase in the EU, which, frankly speaking, looks good. In the US, the increase is softer. In India, there is no increase in the renewable share; here the share is actually shrinking in our forecast. China is the leader in electricity but this is certainly not the case in terms of heat — in 2022, only 5% of total heat demand is covered by renewables." ■

News in brief

INDIA-GERMANY COOPERATION ON RENEWABLE INTEGRATION

India is looking to improve the integration of renewables to the grid through a technical cooperation agreement with German government agency, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. The agreement — recently signed under the Indo-German Energy Programme known as Green Energy Corridors (IGEN-GEC) — is aimed at improving conditions for grid integration of renewable energy. India is implementing phase one of Green Energy Corridors. It already has around 9,400 circuit km of green energy corridors under implementation in India, representing an investment close to \$2 bn.

EGYPT FINALISES NUCLEAR DEAL

Egypt has finalised a deal to build its first nuclear power plant with funding from Russia after nearly two years of negotiations. The power plant will be built in Dabaa, about 130 km (80 miles) northwest of Cairo on the Mediterranean coast. In 2015, Egypt signed an agreement with Russia to build a four-reactor power plant. It will receive a \$25bn loan from Russia to cover 85% of the construction cost of the 4800 MW plant.

UNIDO PARTNERS WITH WORLD ENERGY COUNCIL ON SUSTAINABLE ENERGY SOLUTIONS

The United Nations Industrial Development Organisation (UNIDO) and the World Energy Council have signed a Joint declaration to support the global dissemination of sustainable energy solutions.

Inside this issue

ENERGY IN FOCUS

1



Solar and wind are growing rapidly, but heat and transport need more policy support for renewables' continued growth

FEATURE

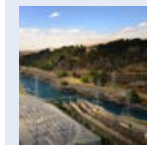
3-4



Putting new business models into practice in Mexico ahead of the energy transition — the World Energy Scenarios get a local application

COUNTRY FOCUS

5-6



New Zealand aims for a balance between prosperity and sustainability with ambitious targets for the coming years

INTERVIEW

7



Seth Kleinman was a respected energy analyst, but he has swapped Wall Street for a project to finance solar panels in Costa Rica

EVENTS

8

All the forthcoming World Energy Council events for your diary, including this month's executive assembly

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ISN'T ON ITS WAY.
WE'RE
APPLYING IT
NOW.**

See how we're applying innovation and deep industry knowledge to real business challenges now at [accenture.pt](https://www.accenture.pt)

**NEW
APPLIED
NOW**

Business model innovation: Mexican style

A new white paper on the country shows how the World Energy Scenarios can be applied locally

Business model innovation is all about how businesses can bring about change in a way that not only delivers profit for the organisation but also creates social value. As the global energy system goes through a grand transition, businesses will need to work out which business models might succeed under the specific conditions found in any individual country.

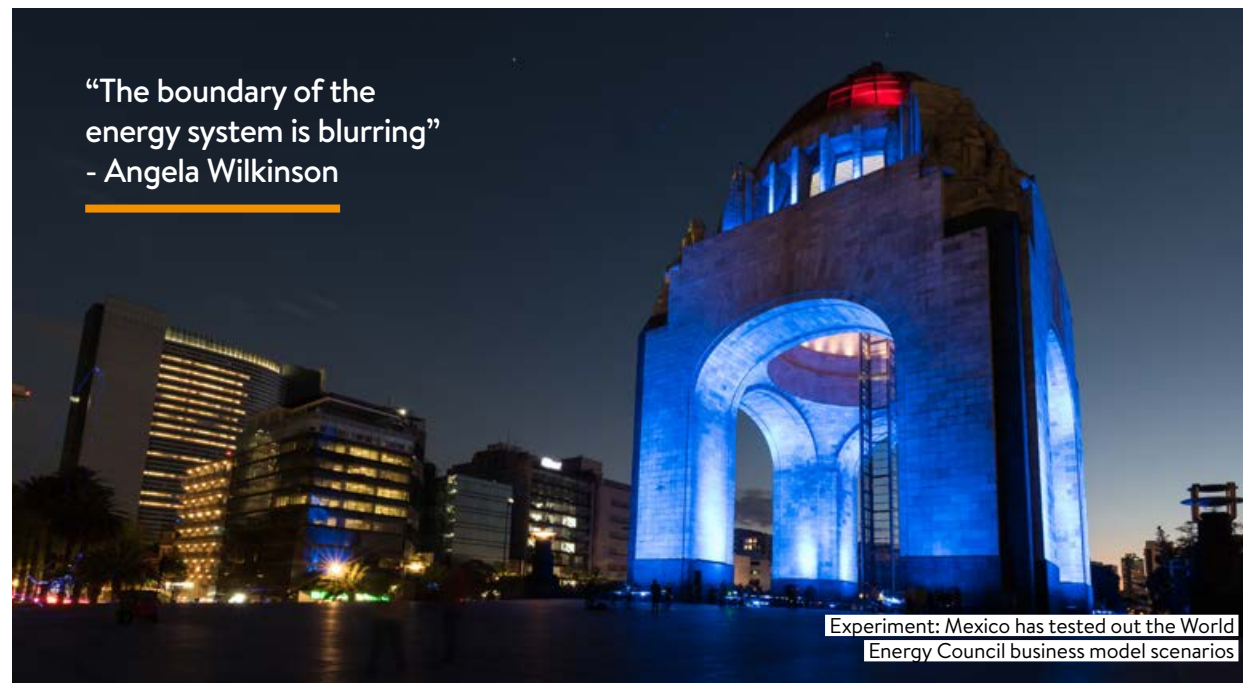
As part of its 'World Energy Scenarios' work programme, the World Energy Council has just presented [Alternative Pathways For Mexico To 2030: Exploring Business Model Innovation](#) — a new analytical paper that looks at what business model organisations might adopt to help transform the country's energy sector.

This white paper comes at a time when leadership attention to business model innovation is growing. Many

individual firms, especially major oil and gas companies and power utilities, are already looking at how the combination of renewables and digitalisation will accelerate the decline of traditional core models. At the same time, new players from beyond the energy system are exploring opportunities in generation, distribution and value-adding services such as e-mobility or green power.

Angela Wilkinson, Senior Director of Scenarios and Business Insights at the World Energy Council, explains: "The boundary of the energy system is blurring. Rather than being just an energy provider, some are moving into providing services that are a sub-component of energy rather than energy being the main attractor. You can imagine a future where people are not buying energy; they are buying services and the cost of energy is a part of that service."

The [World Energy Scenarios to 2060](#) provide a clear framework for addressing strategic questions about business model innovation in the "Grand Transition." These include: what are the vulnerabilities of existing



"The boundary of the energy system is blurring"
- Angela Wilkinson

Experiment: Mexico has tested out the World Energy Council business model scenarios

energy business models? How can the future success of emerging business models be evaluated?

Application phase

Launched in 2016, World Energy Scenarios is aimed at providing a geographical resource that gives a big picture view of the energy transition.

Wilkinson says: "The scenarios are not forecasts of what the future will be but are an analysis of the different drivers that are shaping how the transition might unfold. And what that might then tell us about how we can intervene today to enable a smoother, more sustainable transition."

The scenarios are now entering the "application phase", i.e., they are now

being put to use. Mexico is the first country to apply the scenarios at the national level.

"There are many ways to use the scenarios. But often, to use them we first have to move from the global [level], which can be general, into understanding the diversity of regional dynamics. And to apply business models, we have to move to the national [level], because regional dynamics and national ecosystems are not the same thing," says Wilkinson. "In developing this [business model] application, we had to find a country that really wanted to do this. Our partner in the scenarios flagship is Accenture, which has a Mexico office and was very keen to give this a go.

"The Mexico case study is the pilot for this more grounded and granular application of the World Energy Scenarios. Everybody in Mexico is buzzing at the possibility of really managing a transition that is about bringing benefits to all."

The Mexico case

Mexico's interest is clear. An energy sector reform programme is under way, whereby a number of progressive changes are being made. The nation is interested from both a policy and a business perspective in looking at the new energy ecosystems emerging from developments taking place both inside and outside the energy sector.

Energy reform in Mexico offers

31

different business models
identified in the white paper

EXPECTED ACTIONS



MODERN JAZZ



UNFINISHED SYMPHONY



HARD ROCK

GOVERNMENT AND AGENCIES

- | | | |
|--|--|--|
| <ul style="list-style-type: none"> • Increase regulatory efficiency • Reduce monopolistic power of incumbents in key segments of the value chain • Continue with bidding rounds • Optimise grid transmission | <ul style="list-style-type: none"> • Implement strict regulation to monitor environmental compliance • Provide incentives to lower carbon emissions and adopt renewable energy solutions • Decrease frequency of bidding rounds | <ul style="list-style-type: none"> • Offer financial support to develop non-traditional resources • Increase on the frequency of bidding rounds • Foster efficient resolution of social/security issues |
|--|--|--|

HYDROCARBONS SECTOR

- | | | |
|---|--|---|
| <ul style="list-style-type: none"> • Optimise the use of associated gas • Develop unconventional gas to match demand • Adopt new technologies to increase efficiency | <ul style="list-style-type: none"> • Slow down market openness • Increase taxes on fossil energies • Raise quality standards for liquid fuels | <ul style="list-style-type: none"> • Diversify sources of import • Develop unconventional resources |
|---|--|---|

POWER SECTOR

- | | | |
|---|---|---|
| <ul style="list-style-type: none"> • Modernise transmission grid • Investment on new generation and distributed generation projects • Adopt co-generation and renewable energy solutions | <ul style="list-style-type: none"> • Increase efforts for carbon emissions reduction • Increase investment in renewables and distributed energy • Incentivise for the adoption of sustainable technologies | <ul style="list-style-type: none"> • Slow down of the decommissioning of carbon intensive generation • Focus on energy security measures over carbon emission reduction • Adopt of self-generation solutions to improve energy sufficiency |
|---|---|---|

EXAMPLES OF RELEVANT BUSINESS MODELS IN EACH SCENARIO

"Gas to wire model in gas field areas with shortage of gas pipelines"

Brings a solution for areas of oil production with a lack of gas transport infrastructure. The rapid technology development and the focus on increasing energy access would make this model economically viable.

"Smart house from brick to appliance"

Allows energy conscious consumers to make smarter decisions when building or remodelling. Government may support this business model through fiscal incentives to achieve energy efficiency goals.

"Platform to connect O&G industry players to accelerate development"

Facilitates demand fulfilment through integrating information from multiple companies offering services or products. It contributes to Energy Security by efficiently developing local resources at an accelerated pace.

World Energy Council business model scenarios

the flexibility to adapt to the World Energy Council's different scenarios – 'Modern Jazz', 'Unfinished Symphony' and 'Hard Rock'.

Under the 'Modern Jazz' scenario, Mexico would foster an open and competitive market to achieve accessible energy through rapid deployment of new technologies and business models. In 'Unfinished Symphony', the country would adopt stronger policies focused on environmental sustainability, maintaining its position as a leader among developing countries. Under 'Hard Rock', Mexico would seek to diversify sources of imports, increase local energy supply, and support solutions based on national capabilities.

Being able to shift towards any of the three scenarios allows the local energy sector to embrace global trends and mitigate risks. The current transformation is an unparalleled opportunity for the government, regulatory entities and private companies to adapt and thrive within the energy industry.

A thorough methodology was used in the case study work. Accenture began by looking at how the World Energy Scenarios are understood in the context of Mexico. For example, what would the 'Unfinished Symphony' mean to the current programme of Mexico energy reform? Would it succeed? What would work?

It also identified 31 different business models from around the world and evaluated them in terms of how many were relevant to the specific energy situation in Mexico. It found that 26 of them were applicable.



Angela Wilkinson, Senior Director, World Energy Council

Accenture then considered its findings in the context of the Energy Trilemma framework – the World Energy Council's policy framework, which looks at how policymakers have to navigate the trade-off between security, equity and sustainability.

Wilkinson said: "So they took these three different ingredients: a nationalised understanding of the scenarios; a list of different business models they compiled; and understanding of what the Mexican government is trying to do with its reform programme, and put them together in that context. Then they did an evaluation to work out which of the business models identified as relevant would be most likely to succeed and grow in an 'Unfinished Symphony' world, 'Modern Jazz' world or Hard Rock scenario. And what government policy for future reforms might need to do to guide business

model innovation as another element to make changes happen."

The report will enable stakeholders to leverage the key findings of the Mexico case study to create solid mid-term strategies to face the future challenges within the energy industry.

Just the start

It is hoped the Mexico case is just the beginning of an exercise that could prove useful elsewhere.

Wilkinson says: "We are looking to see where we can whip up interest in another part of the world because regional dynamics are going to be different and the national circumstances will be different.

"After Mexico, we might find some interest in the Middle East. We are also looking at where we might find some interest in Africa because when we look at the renewables plus digitalisation theme, we think there is bound to be something there, with lots of different types of business models. And we think the same about Asia – it's an incredibly diverse region. When we look at China, India or [South] Korea we think they all have very different circumstances."

In a world where more global business models are emerging along with ultra-local business models, and where there is regional diversity within energy systems, business models have to be relevant to the local conditions. There is no one-size-fits-all.

Wilkinson concludes: "We are interested in seeing what we will learn about how business model innovation might contribute to a smooth, inclusive and sustainable transition by repeating the process." ■

New energies: Hydropower is one of the forms of renewable energy in New Zealand

New Zealand: Progress in the Pacific

Ambitious targets on emissions must be met alongside economic growth

Earlier this year, net migration to New Zealand hit a record high, according to some estimates. The fast pace of economic expansion, not to mention some breathtaking scenery and a purported laid-back island lifestyle have all made the Pacific country desirable for incomers.

But while net migration of more than 70,000 people per year hints at the success story of economic growth at almost 3% annually, to a GDP of \$185bn last year, New Zealand has some challenges ahead in its energy sector.

A Paris agreement target of reducing emissions by 30% by 2030 compared with 2005 levels is “ambitious”, admits John Carnegie, secretary of the World Energy Council’s New Zealand committee and executive director of BusinessNZ Energy Council. And Carnegie points out that there are no plans to slow down after that. By 2050, New Zealand is aiming to halve emissions from their current level.

Tomorrow’s market won’t be the same as it is today

He says that traditionally, security of supply was the major challenge for the nation, but that has changed.

“We had a major pipeline outage recently from the oil refinery to Auckland, which is New Zealand’s main city. It closed the airport.

How to maintain infrastructure and build resilience are still important, but decarbonisation is our biggest challenge.”

To that end, New Zealand has retired thermal power stations and increased its electricity generation from renewables to 81% by 2015, up to an estimated 85% today, with some of the highest capacity windfarms in the world.

The efforts have earned the country ninth position on the 2016 World Energy Council’s Trilemma index — a fact of which Carnegie is proud.

“It’s quite an achievement — we are the only non-European country in the top ten,” he says.

The Trilemma rates countries on the balance achieved between energy security, access and affordability, and

environmental sustainability.

In 2015, the BusinessNZ Energy Council launched [BEC2050](#): two New Zealand-specific energy scenarios — Kayak and Waka. Based on the work of the World Energy Council, these scenarios provided two cohesive narratives about New Zealand’s energy future up to 2050, and quantified the outcomes expected under each scenario.

The BEC2050 modelling has allowed New Zealand to go back and ask more detailed questions about how the energy sector might evolve, in this case investigating the prospects for energy and transport sector emissions. The deep dive sets out the potential contribution the energy and transport sector will make to the total 2030 emissions target under the Paris Agreement and sheds light on where

additional emissions reductions may come from.

It outlines the source of emissions in energy and transport and the potential for reductions under each scenario to assist policy setting in the sector, and inform the size of the task in other sectors.

In the Kayak scenario, a global deal on climate change is agreed but international commitments on reducing emissions are still weak. Carbon markets are developed but are fragmented across ad-hoc regional and national schemes. New Zealand governments turn towards the market to drive the uptake of new low-carbon and energy-efficient technology. There are no direct or indirect support mechanisms for these technologies, apart from a modest carbon price.

In the Waka scenario, global leaders

unanimously agree that climate change is the defining problem of our time and a comprehensive global deal is agreed based on strong emissions reduction commitments. In New Zealand, governance and decision-making become more hands-on with climate change mitigation strategies prioritised to meet New Zealand’s international obligations. Emissions from the energy sector are reduced accordingly.

Decarbonisation is our biggest challenge

Policies of the future

New Zealand has only one oil refinery, in Whangarei, and last year produced just under 50 million barrels of oil and 196 billion cubic feet of gas. In 2016 its self-sufficiency was 78%. Exports of all

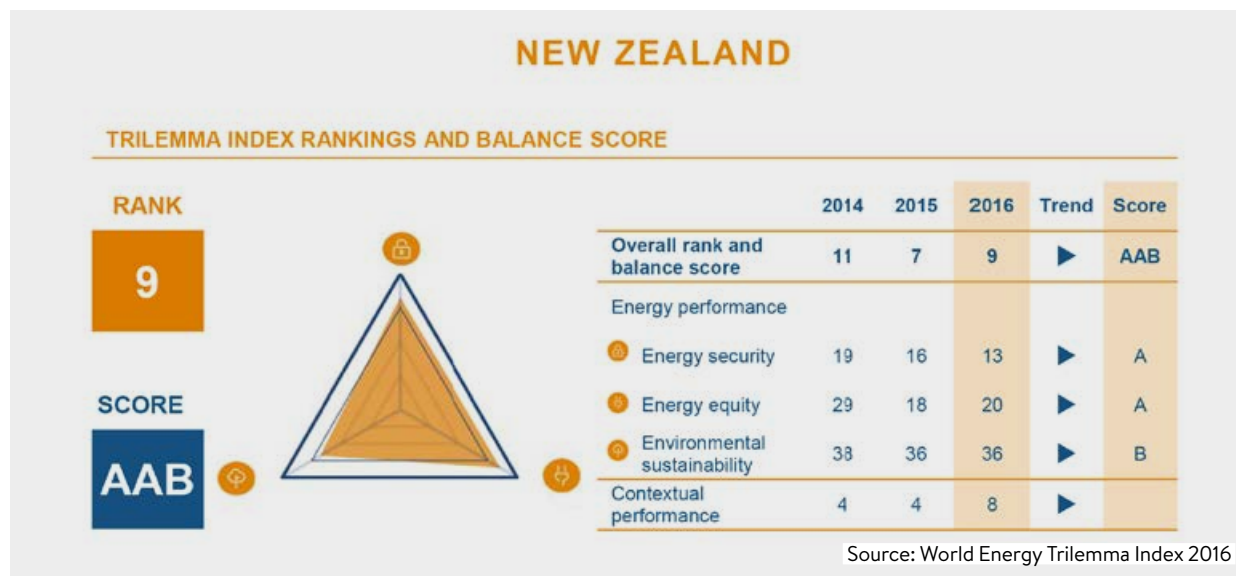
energy types fell last year by 19%, for which the government largely blames lower commodities prices.

New Zealand held elections on September 23 this year, with the centre-right National Party winning enough seats to form a minority government. However, the coalition who will form the government was still being negotiated as World Energy Focus went to press, meaning the impact of a political reshuffle on energy markets won’t be fully known yet.

Carnegie highlights the introduction of vehicle emissions standards and continued upgrading of the housing stock as future policies which might help the country gain efficiency without impeding further economic growth.

In the meantime, a Productivity Commission has set up an inquiry to work out how this balance can best be struck. It looks at factors such as how to reduce emissions from agriculture, which are currently at about 50% of the total, but complex to tackle. “How New Zealand responds to its international commitment to reducing greenhouse gas emissions will have major implications for our future,” said chairman of the commission Murray Sherwin.

“People understand that things are changing. Tomorrow’s market won’t be the same as it is today,” Carnegie says. ■



30%

How much emissions will be reduced by 2030

From oil to solar

One of Wall Street's best energy analysts explains why he is packing up to go and sell solar panels in Costa Rica

"As of the end of this month I will go from making a lot of money to zero."

Seth Kleinman is explaining why it's been such an easy decision to leave his job as global head of energy strategy at one of the world's biggest banks to move to Central America.

Kleinman is eloquent and punchy on the subject of oil. It's why his commentary on the market for Citi has been so popular. He believes an epoch-making shift is underway in global energy, and it's visible on rooftops, where solar panels are proliferating at a pace few analysts expected.

He has long argued that the days of peak oil demand are closer than many commentators think. Kleinman aims to use his expertise in banking and interest in renewables to facilitate funding for green energies, starting with financing Costa Rican solar developer Sibo Energy.

The nascent distributed generation movement—small-scale independent power that frees people and businesses from the grid—is proving that "even people with aggressive market development forecasts can be wrong," says Kleinman.

"It's not about one centralised actor, whether it's a Rockefeller or a government," deciding the shape of the energy system, he says. "Every single person in this restaurant can say 'To hell with it, I'm going to get in this game'. That's why this one is different."

He wants to be part of the change, so has started the Avolta company with two friends. It is an engineering, procurement and construction firm to develop and sell solar, starting in Costa Rica but expanding eventually across the Caribbean. The partners are raising private money in London, but will turn to institutional financing at a later stage.

Do you want to be in an industry fighting structural decline or one facing exponential growth?

The analyst in him took a macro view and decided to act on it. "The structural trend is so obvious. Do you want to be in an industry fighting structural decline or one facing exponential growth?"

It's a question the oil sector needs to answer. For too long, industry leaders have dismissed renewables, thinking they were too marginal to pose a threat. Kleinman waves this away between steak bites. "People focus on 'can you go to 100% renewables?' Who cares?"

Systematic change isn't needed to cause serious disruption to the existing industry, he argues. "Look at coal. Global demand comes down 2% from its all-time high and the entire US coal sector goes bankrupt." His point isn't that one fuel will entirely replace

another—it's that as one starts to bite at the margins, the growth story for the incumbent will come under pressure.

Kleinman says the growth of renewable energies and electric cars could pose a threat to oil prices.

"What does Aramco do, what does Kuwait do? They're sitting on 70 years of reserves." If the market looks like it's going to start shrinking, Kleinman suggests, the response might just be "We've got to get it out now". If so, "you're into the \$10-20 [per barrel] oil scenario".

And in the long-term, rather than stimulate demand, these kinds of prices for oil could simply weaken the economies of countries that produce oil, sapping consumption.

Meanwhile, technology is changing demand elsewhere. Kleinman thinks improvements in energy-storage capacity—several new battery factories will come online this year—could yield price drops of 20–30% in the next 18 months. If so, yet more renewable-energy capacity will be available. "A lot of stuff that looks marginal becomes viable."

That's more good news for electric vehicles. Imagine plugging your car in at home so your solar-charged-battery can feed the motor all night. "Elon Musk has totally changed the world," he says, talking of the Tesla founder. "People say you can't drive from London to Edinburgh in an EV. But, a), you probably will be able to soon, and b), who drives from London to Edinburgh these days? Give it five or 10 years and you're not going to be able to drive into London or Paris or half the cities in Europe unless you're driving an EV." ■



Bright star:
Seth Kleinman

2017 Executive Assembly 16–19 October 2017 Lisbon, Portugal

Next week, the Executive Assembly of the World Energy Council's will convene over 1000 energy leaders, from industry, governments, and academia for ongoing dialogue on the challenges and opportunities facing the energy sector.

Hosted by Portugal, the week-long annual general gathering of the global energy leaders' network will welcome the President of Portugal, top CEOs and Ministers from Portugal and around the world in peer-to-peer discussions. Topics for discussions will include New Dynamics of Natural Gas and LNG Markets, Blockchain and Digitalisation in the energy sector or Decentralised Systems and Regional Interconnection.

[Register now](http://worldenergyassembly2017.org/en) and learn more on the events website: <http://worldenergyassembly2017.org/en>



MEMBER COMMITTEE EVENTS

Symposium on Climate Change and Droughts Resilience in Africa 17–18 October 2017 Nairobi, Kenya

A truly interdisciplinary event, mobilising aid workers to scholars, practitioners and members of governmental and non-governmental agencies, the event will focus on “building resilience to climate change and droughts in Africa”. Co-hosted by the Kenyan member committee, the United Nations Environment Programme, World Health Organisation and the International Climate Change Information Programme, attendees will learn from experts about drought specific research, field projects and best practice to foster adaptation among countries in the region.

For more information, visit the website:
<https://www.haw-hamburg.de/en/ftz-nk/veranstaltungen/drought2017.html>

Nordic Energy Forum 14–15 November 2017 Helsinki, Finland

The Finnish member committee of the World Energy Council hosts its regional summit: the Nordic Energy Forum. Responding specifically to the need for increasing international cooperation in the regional energy sector, the Nordic Energy Forum serves as a networking event and source for the latest information for energy industry experts. Gathering participants from all over the Baltic Sea region and beyond, the two-day programme covers topics from European Union energy policy to electricity

markets, transport and digitalisation. Speakers and panellists include policymakers from national ministries, key leaders from EU bodies and form the energy business sector in the region such as the CEOs of Vattenfall, CEO Fortum Corporation, Eesti Energia, GE Europe or Pohjolan Voima. For more information, visit the website:
<http://tapahtuma.expomark.fi/nordic-energy-forum/>

German Energy Day 21 November 2017 Berlin, Germany

Europe has set ambitious energy and climate policy goals but the variety of national interests – within and outside – the European Union continue to challenge the common joint energy and climate strategy. What

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Portugal Energy Day 18 October 2017

This event is part of the Council's Executive Assembly week and will focus on “Keeping ahead of energy challenges” from a Portuguese perspective. With a programme looking at decarbonisation and recasting the electricity market, speakers will represent the business makers, policymakers and regulators in the country together with the innovators that are shaping and driving the energy transition in the country.

The Energy Trilemma Summit 19 October 2017

The summit will take place on the last day of the week. Its agenda builds upon the new signals emerging in the energy sector such as disruptive digitalisation or the commitment to decarbonisation. Open for all energy leaders and practitioners to attend, this event will advance public/private sector dialogue to design long-term sustainable energy policies.

are the new post elections energy policies in UK, France and Germany? What kind of impulse should COP 23 in Bonn provide to strengthen the Paris Agreement? What should each country's contribution be to secure a sustainable global transformation of our energy systems? What role will Estonia play in leading the way as Europe enters the digital energy age? These are some of the topics that will be discussed by global energy experts, only a few days after COP 23, at the 2017 German Energy Day hosted by the World Energy Council's German member committee!

For more information, visit the website:
<http://www.weltenergiertag.de/veranstaltungen/energiertag/>

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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