

**WORLD
ENERGY
COUNCIL**

World Energy Issues Monitor | 2018



**PERSPECTIVES ON
THE GRAND ENERGY
TRANSITION**

ABOUT THE WORLD ENERGY COUNCIL

The World Energy Council is the principal impartial network of energy leaders and practitioners promoting an affordable, stable and environmentally sensitive energy system for the greatest benefit of all.

Formed in 1923, the Council is the UN-accredited global energy body, representing the entire energy spectrum, with over 3,000 member organisations in over 90 countries, drawn from governments, private and state corporations, academia, NGOs and energy stakeholders. We inform global, regional and national energy strategies by hosting high-level events including the World Energy Congress and publishing authoritative studies, and work through our extensive member network to facilitate the world's energy policy dialogue.

Further details at www.worldenergy.org
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World Energy Council

Registered in England and Wales
No. 4184478

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Registered Office

62–64 Cornhill
London
EC3V 3NH
United Kingdom

ABOUT THE WORLD ENERGY ISSUES MONITOR

The World Energy Issues Monitor provides a snapshot of what keeps CEOs, Ministers and experts awake at night in over 90 countries. The monitor helps to define the world energy agenda and its evolution over time. It provides a high-level perception of what constitute issues of critical uncertainty, in contrast to those that require immediate action or act as developing signals for the future. It is an essential tool for understanding the complex and uncertain environment in which energy leaders must operate, and a tool through which one can challenge own assumptions on the key drivers within the energy landscape.

This ninth iteration of the monitor is based on insights provided by more than 1,200 energy leaders to provide over 30 national assessments across six regions. 2018 will see the launch of a new interactive online tool for visualising the data that underpins the Issues Monitor, developed in collaboration with our Project Supporter ARUP.

FOREWORD

I am pleased that participation in this year's survey has once again exceeded 1200 energy leaders; including Ministers and CEOs from over 90 countries. This year's report includes 38 national issues maps including three new countries, Malaysia, Slovenia and Cameroon. I would like to thank all who have taken the time to respond to our invitation to participate. The World Energy Council's issues survey provides the basis for our unique macro perspective of the perception of critical issues in the energy sector, how they change over time and differ across regions. Once again, I would also like to recognise our Future Energy Leaders for their contribution. It is clear from the results that our community of leaders of the future are anticipating an accelerating/rapid energy transition.

It is important to include the participation and voice of Future Energy Leaders and current energy leaders, and to reflect regional perspectives, the World Energy Council is committing itself to broader participation, to include voices from new energy shapers within and beyond the energy system. Looking forward, we aim to reach out to new start-ups, 'prosumers', energy service providers and policy innovators. In this context, I am particularly pleased that for the first time we also have gathered input from the Start-up Energy Transition Award community, which every year identifies 100 top innovators and start-ups in the global energy scene. It is fascinating to see that for most issues the SET100 community has a similar perspective as the rest of the Energy Leaders community. However, there are pointed exceptions such as digitalisation or commodity prices – the former being even more relevant and the latter as less so by the frontier community.

This year's Issues Monitor report reflects an energy world in an accelerating transition toward digitalisation, decentralisation and decarbonisation. The Council's tracking of the movement of 42 issues over a decade, indicates that there is a dramatic shift in policy and implementation. For instance, electric storage and innovative transport are trending upwards in terms of their importance to the world energy systems of today and the future, whereas centralised energy technologies, such as coal, nuclear or CCS [Carbon Capture and Storage], have continued to decline in terms of energy leaders' perceptions of what matters. This decline in attention is reflected in the action plans of many European countries who are working to phase out coal and nuclear. The tracking of digitalisation, decentralisation, and decarbonisation are further illustrated and explained in the Introduction.

Lastly, the Issues Monitor report provides unique global, regional and national perspectives which can be used in combination with our other tools such as the Energy Trilemma content to enable countries to bring equity, security, and sustainability to all their citizens through the development of their national energy systems. The Issues Monitor is a key tool in our transition toolkit and the Council's mission to be at the heart of the energy transition. It is the Council goal to have all countries add their perspectives in future publications.



Christoph Frei

Secretary General, World Energy Council

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OVERVIEW

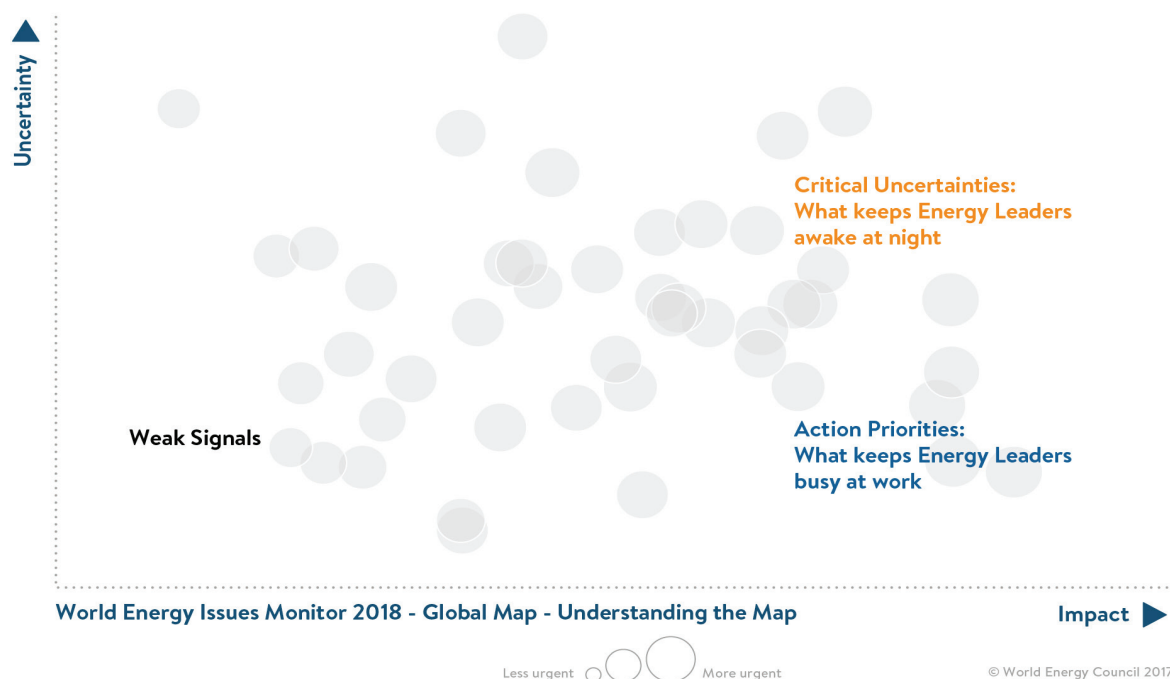
This is the ninth consecutive year of the World Energy Council's (the Council) annual survey of key challenges and opportunities faced by energy leaders in managing a robust energy transition. This year's report provides nine global maps, six regional maps and 38 national maps illustrating issues impacting the energy landscape in the different geographical contexts. This report also includes input from the Start-up Energy Transition Award community, which every year identifies 100 top innovators and start-ups in the global energy scene.

These maps have been developed by analysing the perceptions of key issues from over 1,200 energy leaders across the Council's national member committee network. The World Energy Council's Issues Monitor is the only instrument that identifies the energy context of specific countries and regions in the world, through an analysis of 42 issues affecting the energy system.

By providing a common platform for diverse actors and different countries to voice their concerns on the level of urgency, uncertainty and impact of key issues, this powerful tool offers unique insights into the pace and shape of energy transitions which are occurring at local to global levels.

An Issue Map is a visual snapshot of the uncertainties and action priorities faced by energy leaders. Using these maps, decision makers can develop a global perspective, appreciate regional variations, and identify key trends. The maps can also be used to monitor trends relating to specific technology solutions.

FIGURE 1: Graphical snapshot - Understanding the Issues Maps



The Council's Issues Monitor is one of the five main tools forming the **Transition Toolkit**¹, which are being used by the Council's members to appreciate the challenges of energy transition. The Council has developed these tools because navigating a robust transition requires new approaches to flexible cooperation across many and more diverse energy system actors. There is no right or best place to start with – the most important thing is to try to learn more about the state of the energy system and try to make change happen. Any one of these tools can be used by energy leaders and energy innovators across the many parts and levels of the energy system, to engage in conversation, forge new common grounds and develop new collaborative actions aimed at managing timely and robust energy transitions.

HOW TO READ THE MONITOR

The World Energy Issues Monitor assesses 42 issues in a high-level overview, covering four categories

(see figure 1 – Graphical snapshot - Understanding the Issues Maps):

1. Macroeconomic risks, 2. Geopolitics, 3. Business environment and 4. Energy vision and technology

Dimensions/Axes

The responses are translated into issue monitors with the three assessed dimensions:

- » The impact of an issue on the energy sector – this forms the x axis.
- » The degree of uncertainty related to its impact – this forms the y axis.
- » The urgency with which we need to address the specific issue – this is represented by the proportional size of the issue bubble. A larger size corresponds to a higher degree of urgency.

Zones within the Monitor

- » Critical uncertainties: Issues with high uncertainty and high impact (in the top-right quadrant) are the 'critical uncertainties' with no clear path of action. These issues keep energy leaders most awake at night need to be part of the energy leaders' dialogue and scenario analysis.
- » Action priorities: The issues in the high-impact and low-uncertainty space are those which keep energy leaders busiest (bottom-right, 'action issues').
- » Weak signals: The low-impact and low-uncertainty issues (bottom-left quadrant) include those of perceived lesser importance or those that are still not fully understood and need further investigation.

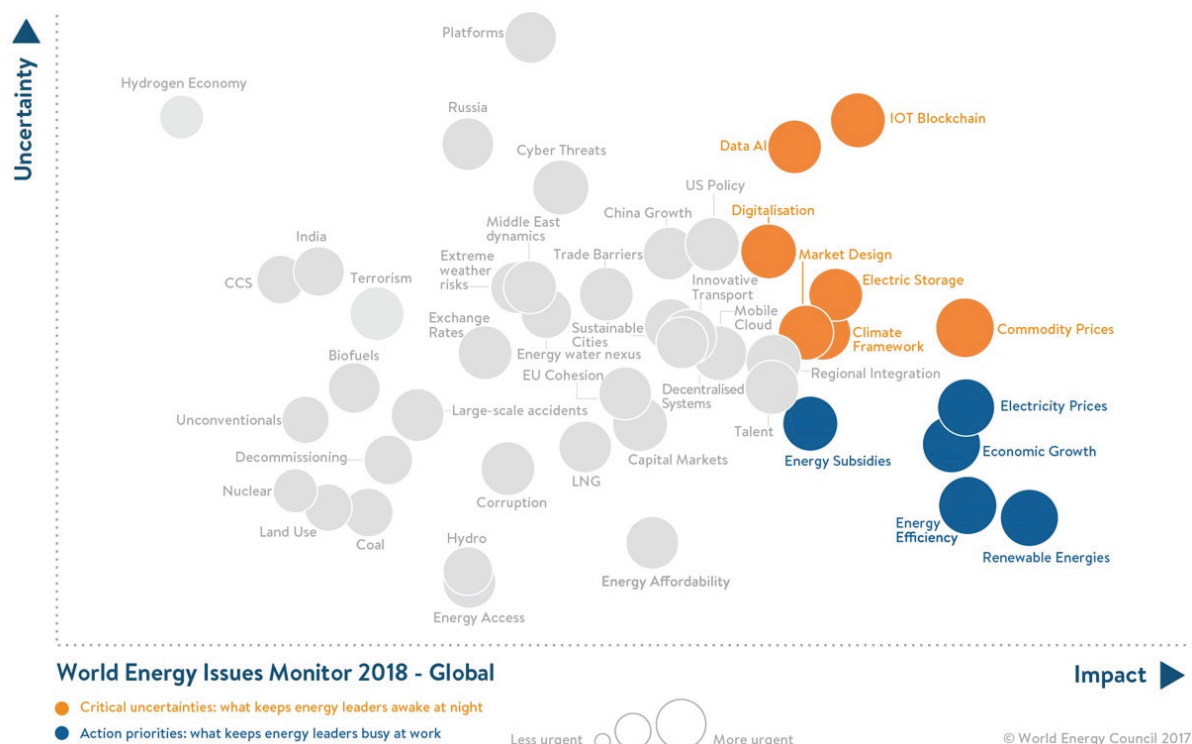
¹ Issues Monitor Report, World Energy Scenarios, Energy Policy Trilemma Index, Dynamic Resilience Initiative, and Innovation.

Global Perspective

GLOBAL PERSPECTIVE

This ninth iteration of the Monitor provides a total of 53 maps across six regions to highlight differing regional and national priorities and the resulting global perspective on the energy transition. The resulting Global Map is built from the sum of national responses and it's shown below.

FIGURE 2: The Global Perspective on the Energy Transition



This global map provides a unique perspective which enables energy leaders to distinguish the signals of change that matter. The 2018 Global Issues Map indicates that innovation is the key area of concern. Issues such as digitalisation, electric storage, market design, decentralised systems, and renewable energies are receiving greater attention as their impact grows across the energy industry. The Global Issues Map also shows a decrease in attention around centralised technologies and greater certainty around electricity prices and energy affordability. We also see that increased impact of digitalisation is facilitating a rapid convergence of alternative technologies such as renewable energies, blockchain and data AI.

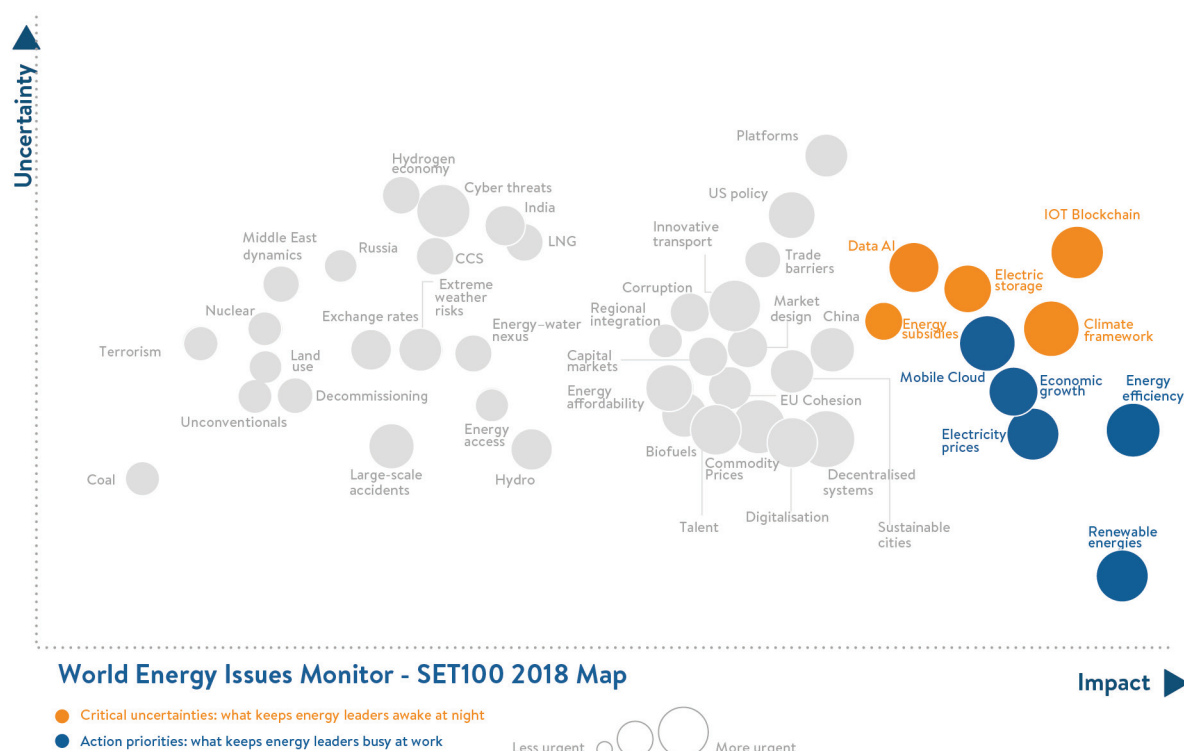
THE SUSTAINABLE ENERGY TRANSITION AWARD – THE INNOVATORS AGENDA

For the first time, the Issues Monitor has gathered input from the Sustainable Energy Transition Award (SET100) community, which every year identifies the 100 top innovators and start-ups in the global energy scene. This is an important global perspective to understand, as innovators, much like early adopters, set the tone for what is to come. Figure 3 shows how energy leaders compare with

energy innovators throughout the world. **Blockchain²** appears with the same level of high impact and high uncertainty in both SET100 and Global Perspective Maps. This suggests that the increasing pace of innovation is difficult for both start-ups and Energy Leaders to understand. Whilst we expect that innovators will focus on nascent technology and work to maximise its utilisation, it is fascinating that this new technology has also seized the imagination of the energy leaders around the world.

Renewable energies are also positioned with high impact but there is greater confidence about their increasing role. Other issues in the map such as electric storage are also gaining attention from energy leaders and innovators.

FIGURE 3: The SET100 Issues Map



² Blockchain is a digital platform technology that is being used to enable secure smart grid transactions – It is referred to as a distributed ledger technology. Distributed ledger technology platforms enable identical copies of recordings of transactions to be shared and viewed by all members of the network in real time, in the consensus process is used to agree on additions. The database itself can be used to confirm identities, apply time stamps, conduct transactions, and create records. For more information: https://www.worldenergy.org/wp-content/uploads/2017/11/Full-White-paper_the-developing-role-of-blockchain.pdf

OECD AND NON-OECD – COMPARISON OF THE AGENDAS

Figures 4 and 5 illustrate how OECD and non-OECD countries are defining their respective energy transition agendas and the underlying issues involved. These maps help reveal how issues are perceived differently between the two groups. For example, within the energy security dimension, the level of impact of **digitalisation** and **cyber threats** are perceived as substantial among OECD countries, whilst it's not a priority for non-OECD. Among the latter, economic growth is higher on the agenda and is strongly associated with energy security³ concerns. **Economic growth** is the differentiating priority energy concern between these two groups, as it frontloads and drives the action on all other issues in non-OECD countries while OECD countries are able to prioritise action on implementing new technologies and exploring the potential of digitalisation.

This difference can be also seen within the energy equity dimension where, even though **electricity prices** are similarly positioned between the two groups, the issue for non-OECD is highly impacted by energy affordability with a level of dependence on energy subsidies, while with the OECD it is more related to market change, with the influence of digitalisation, integration of new energy technologies and the conditions imposed by climate regulations.

As non-OECD countries develop, digitalisation and cyber threats will increase in impact for this group as well. This already creates new opportunities for cooperation around strategic learning about these 'future' issues, which can positively impact the transition by reducing the learning time for the non-OECD and contributing to further accelerate energy development.

Finally, a point of synergy exists around the environmental sustainability dimension which is similarly led between the two groups by actions on **renewable energy** and **energy efficiency**, even though the impact of **climate change** is higher among OECD countries. Still, the **energy water-nexus** has a much higher impact in non-OECD. This can be attributed to challenges faced by water management programmes which are severely by the impact of a fast-growing population and lack of natural disaster resilience infrastructure among these countries.

FIGURE 4: The Trilemma Dimensions in OECD Countries

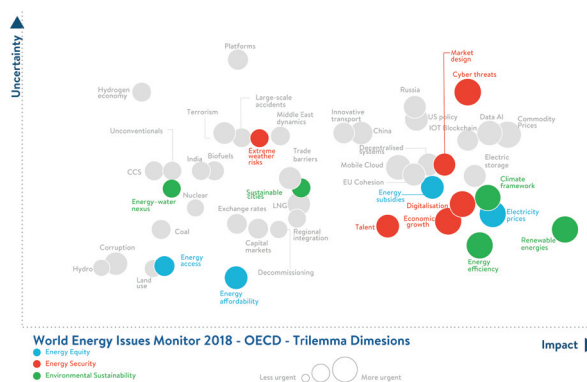
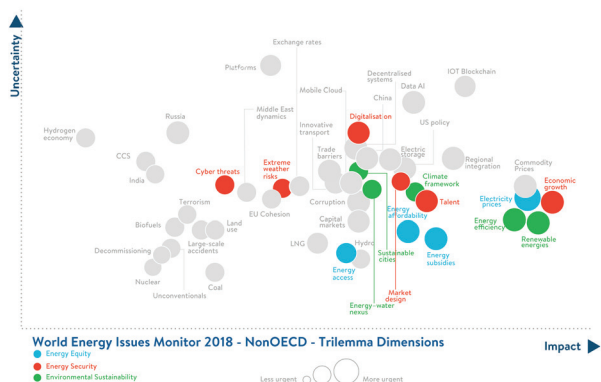


FIGURE 5: The Trilemma Dimensions in Non-OECD Countries

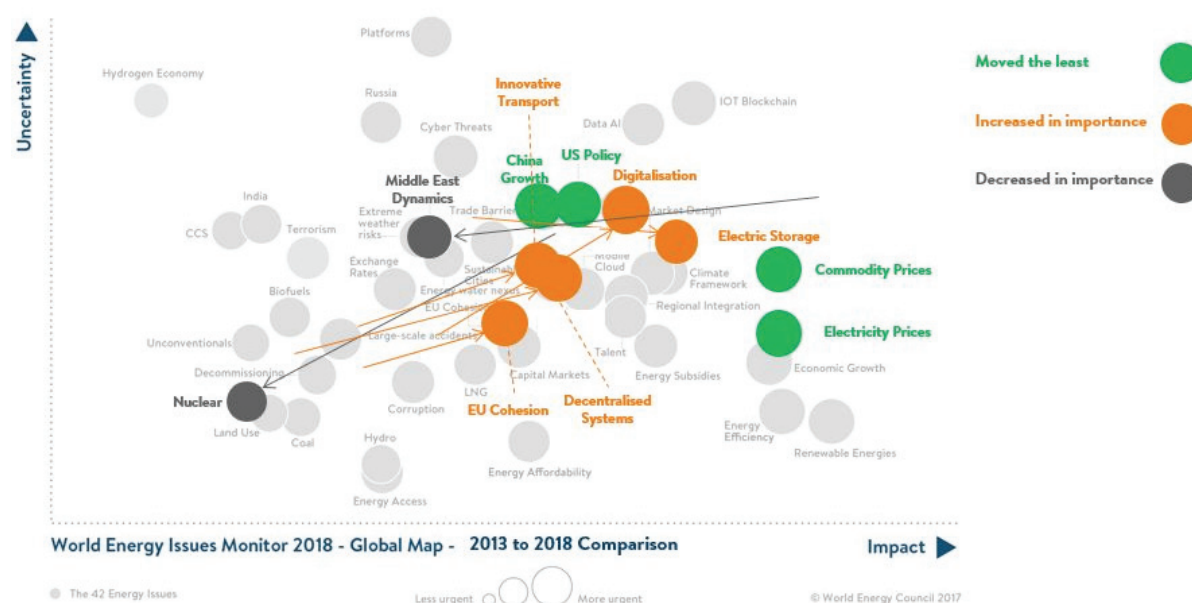


3. Energy Council's definition of energy sustainability is based on three core dimensions – energy security, energy equity, and environmental sustainability.

TRACKING TRENDS

Figure 6 tracks how different issues have changed position over the last five years from a Global perspective. Issues such as digitalisation, and electricity prices are tracked since 2013. The map reflects the ongoing transition towards a decentralised system based on renewable energies, and continued digitalisation. What has stayed constant with the least amount of movement over the years are **electricity prices**, **US policy** and **China growth**. These issues have significant impact on all countries. On the other hand, the issues that have increased in importance show that the energy transition is moving in the right direction. **Digitalisation** and **electric storage** have greater importance, showing their expanding role in transforming renewable energies from a niche resource into one with consistent participation in the generation supply mix. Lastly, this year's analysis identifies **nuclear** as one of the issues that has decreased in importance as Europe works to phase out nuclear power from their supply source and Japan is hard at work to do the same, if possible.

FIGURE 6: The Issues Monitor 5-Year Tracking



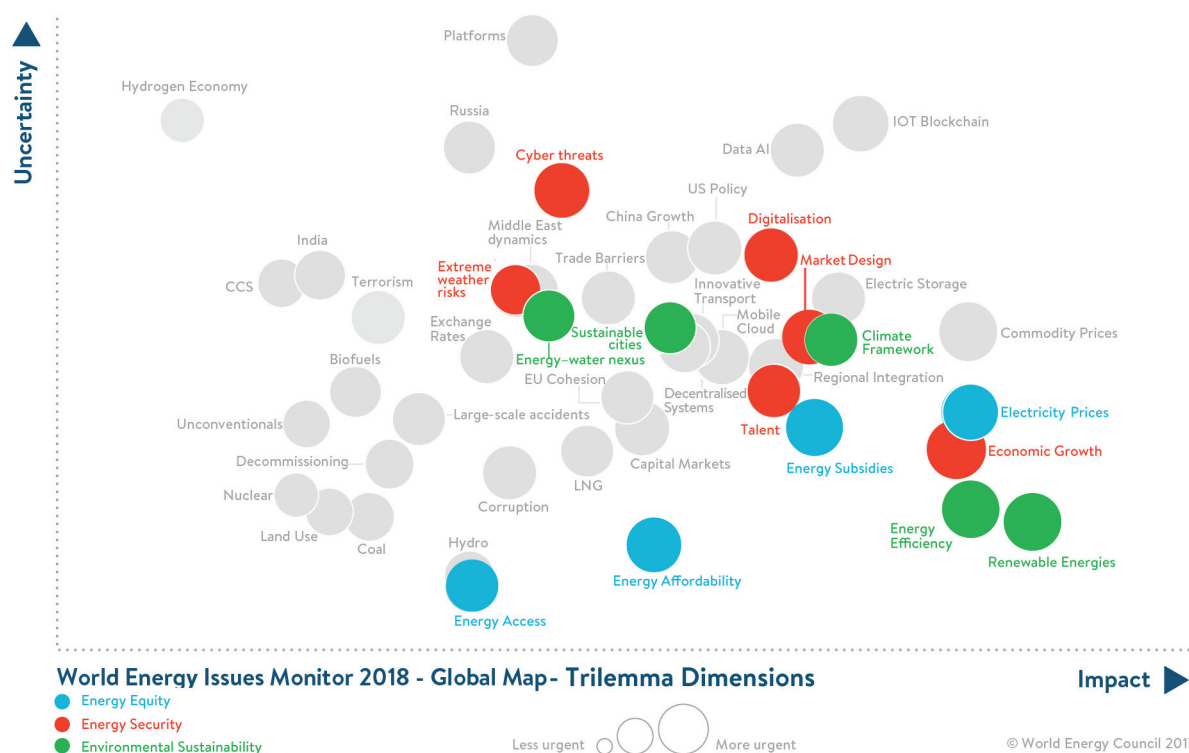
Reviewing the first five Global Issues Maps in this section, it is evident that there has been continued evolution of the global energy sector towards a more diversified global energy mix with greater penetration of renewable technologies; there has also been a shift away from centralised and towards more decentralised systems to accommodate this; and growing interest in technology innovation, digitalisation and use of data.

LINKING THE TRILEMMA WITH THE ISSUES MONITOR

The Council's definition of a robust (i.e. timely, well managed and global) energy transition reflects the challenge of balancing: energy security, energy equity, and environmental sustainability. Balancing these three goals constitutes a 'policy trilemma' and is the basis for the long-term prosperity and competitiveness of individual countries. To aid the dialogue on improving energy policy and to illustrate potentially conflicting policy drivers, this section brings a fresh analysis of global energy issues through the three dimensions of the Energy Trilemma, as illustrated in Figure 7. Moreover, when associated with a long-term analysis, this tool can provide a powerful representation of the directions that the energy transition is taking and the resultant opportunities and challenges that arise.

In the **energy equity** dimension, energy access and affordability are surprisingly not seen as an urgent global action priority. According to the latest data published by the World Bank, 100% of high income world citizens have access to electricity while only 35% of the low income does. Technology and decentralisation is expected to address this continued divide. As fast as the world is embracing technology and decentralisation, several countries with a total population of over one billion people are still working towards universal electricity access delivered reliably and affordably. At today's stage of the transition, however, concerns are much more focused on the impact of subsidies and electricity prices as new technologies are being added to the mix, and as traditional and new energy resources redefine their space in the global energy economy.

FIGURE 7: The Global Energy Issues and The Energy Trilemma



The next dimension of the Trilemma is **energy security**, where Market Design is seen with greater uncertainty than clean energy-related issues. This is shaping an energy security environment that is mostly impacted by the urgency of adaptation to the rapid changes brought by the integration of new energy technologies. Indeed, Market Design permeates all trilemma dimensions, where the critical uncertainties coincide with early market processes (including IoT/Blockchain and Data AI) and action priorities are associated with issues such as Renewable Energies and Energy Efficiency. These issues, in turn, already benefit from a more developed market structure in many countries.

Finally, the **environmental sustainability** dimension suggests that new market structures first need to be developed to enable successful integration of supportive technologies. Energy efficiency and renewable energies processes will need to evolve before Sustainable Cities, the Energy-Water Nexus and even the Climate Framework challenge becomes more certain from the perspective of global energy leaders. It should be noted, however, that even though many countries are increasingly developing and incorporating clean energy policies, fossil fuels are still an important part of the globe's energy mix. The Council's *World Energy Scenarios*⁴ show that fossil fuel share of primary energy has shifted just 5% in the last 45 years from 86% in 1970 to 81% in 2014. According to the Scenarios' 2016 research, the momentum of new technologies and renewable energy generation results in the diversification of primary energy. Fossil fuel share of primary energy falls to 70% by 2060 in the *Hard Rock* scenario, 63% in the *Modern Jazz* scenario, and 50% in the *Unfinished Symphony* scenario. While the incorporation of clean energy is evident, it is crucial to understand the stage of development of each energy resource for a well-informed transition planning.

It is worth noting that although there is high uncertainty around innovation issues such as Data AI, IoT Blockchain, Electric Storage and Innovative Transport, this cluster is just lightly reflected in the Trilemma trade-off framework, where resilience issues are not heavily influenced by the role of technology and policy innovation. This will be one of the most exciting spaces to observe as to what extent innovation will be transforming and overcoming the trade-offs for energy equity, security and sustainability.

THE RISE OF DECARBONISATION, DIGITALISATION, AND DECENTRALISATION

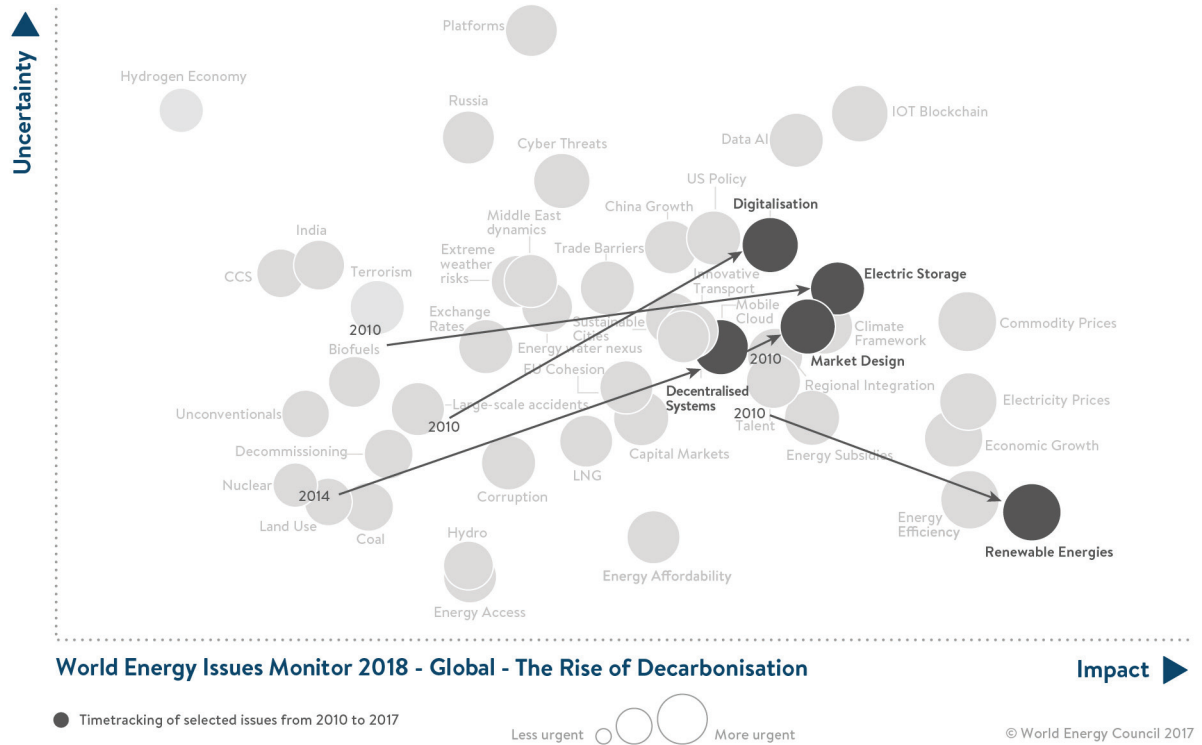
In the next series of maps, we review how the global energy landscape continues to shift toward decarbonisation, digitalisation, and decentralisation. Renewable energies and other technologies that will help it become more reliable will continue to drive energy innovation. This is not to say that demand for fossil fuel is reducing: fossil fuel installed capacity through 2030 is on an upward trajectory.

Since 2010, the Monitor has tracked a steady and significant increase in energy leaders' attention to the path of **decarbonisation**, as illustrated in Figure 8. This is not surprising considering the contributing role of digitalisation, electric storage and market design in the transition towards a robust energy future. It becomes therefore crucial to improve clarity around the strategy and value of innovation as we move forward. Across the 6 regions covering the global agenda for this year's report, renewable energies appeared as the utmost action priority issue, showing a high impact and much less uncertainty than the results of 2010. The dramatic fall in prices of renewable energies

4 - <https://www.worldenergy.org/publications/2013/world-energy-scenarios-composing-energy-futures-to-2050/>

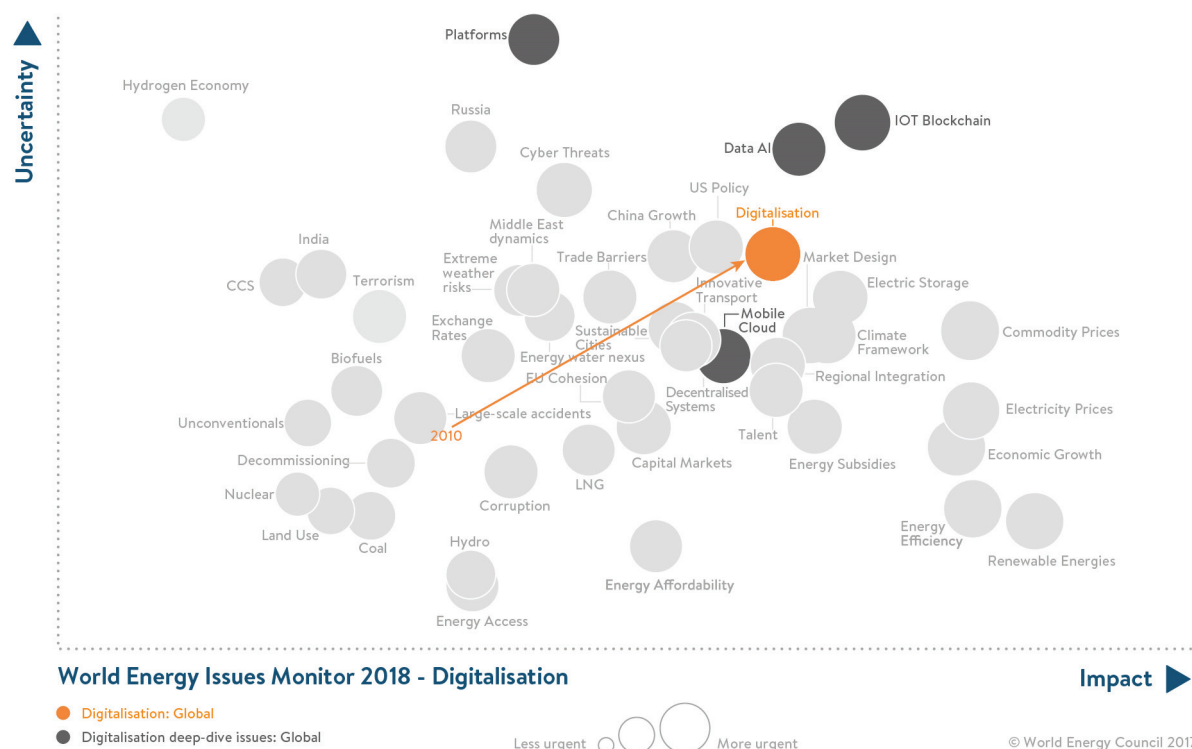
explains this movement. However, it is also important to track the concerns related to electric storage for a more comprehensive picture of the evolving renewables context.

FIGURE 8: The Rise of Decarbonisation



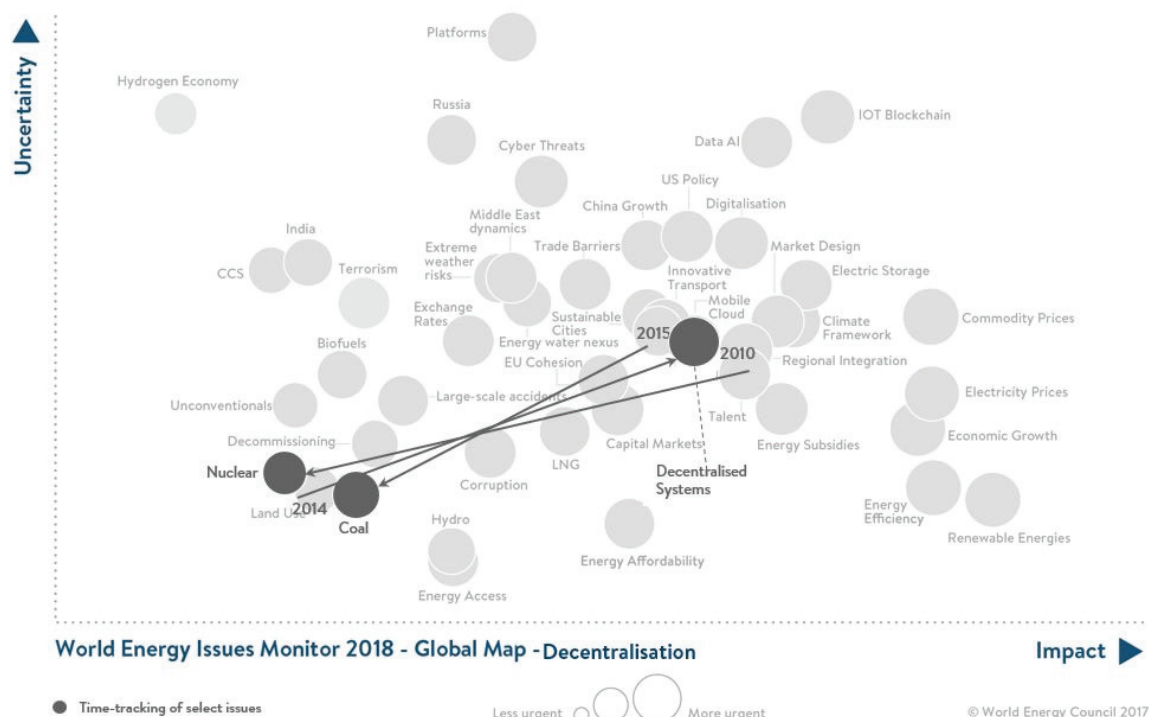
As the innovation cluster rises in the energy leaders' agenda, there is a key focus on issues linked to **digitalisation** (Figure 9: The Rise of Digitalisation) and the action needed to facilitate the convergence of new energy technology including Data AI, Mobile Cloud and Blockchain. These developments are bringing new actors into the energy system such as tech companies and software developers, and enabling the rise of the prosumer. Countries such as China, Japan and Italy are at the forefront of the digitalisation process and differentiate from many countries by having this issue as an action priority with a very low level of uncertainty. These experiences will be instrumental to aid the digital transition by showcasing success stories and technology integration strategies.

FIGURE 9: The Rise of Digitalisation



Finally, in line with the digital evolution process and the changing role of consumers as active contributors to the energy industry, centralised technologies such as nuclear and coal have decidedly dropped in attention and priority, as seen in Figure 9. In turn, decentralised systems, including innovative business models for demand side innovation and management, move progressively in the opposite direction, as markets start to be designed to allow for behind-the-meter generation and for structured prosumer-grid operator communication. Germany, Belgium, Portugal, Canada, Colombia, Namibia and Nigeria, are among the countries that have highlighted progress towards incorporation of decentralised energy solutions and an enabling market design in this year's Issues Monitor.

FIGURE 10: The Rise of Decentralisation



NEXT STEPS - REGIONAL AND NATIONAL PERSPECTIVES

In the full Issues Monitor publication we provide regional perspectives followed by national issues maps and commentaries based on each country's own survey results. The national maps along with specific commentaries are invaluable not only to energy leaders active in these countries, since the survey's outcomes are a self-reflection of where the respective national leaders see themselves in the Grand Energy Transition, but also to neighbouring countries and regions as a point of comparison as well as a way to learn from the experiences and policies of others.

The Council is therefore delighted that 2018 is seeing the inauguration of the **World Issues Monitor Tool**, a digital platform designed to gather in one place dynamic map views of the decade of Issues Monitor data that has been collated by the World Energy Council. The maps convey a narrative of the key energy issues, regional and local variances and how these have changed over time. The tool allows the preparation of different maps for comparison and allows the manipulation of data by geography, over time, or in relation to specific energy issues.

As an active stakeholder in the global energy transition, the Council invites you to explore these analyses and to take advantage of the Energy Transition Toolkit and the wealth of innovative information it provides in support of the transition process.

The World Energy Council is the principal impartial network of leaders and practitioners promoting an affordable, stable and environmentally sensitive energy system for the greatest benefit of all.

This report is uniquely positioned to support intergovernmental organisations, governments and companies to broaden their understanding of global, regional, and national energy issues. The Issues Monitor provides an impartial perspective by including all the world's economic areas, every kind of energy ranging from renewables to fossil fuels, and every kind of organisation.

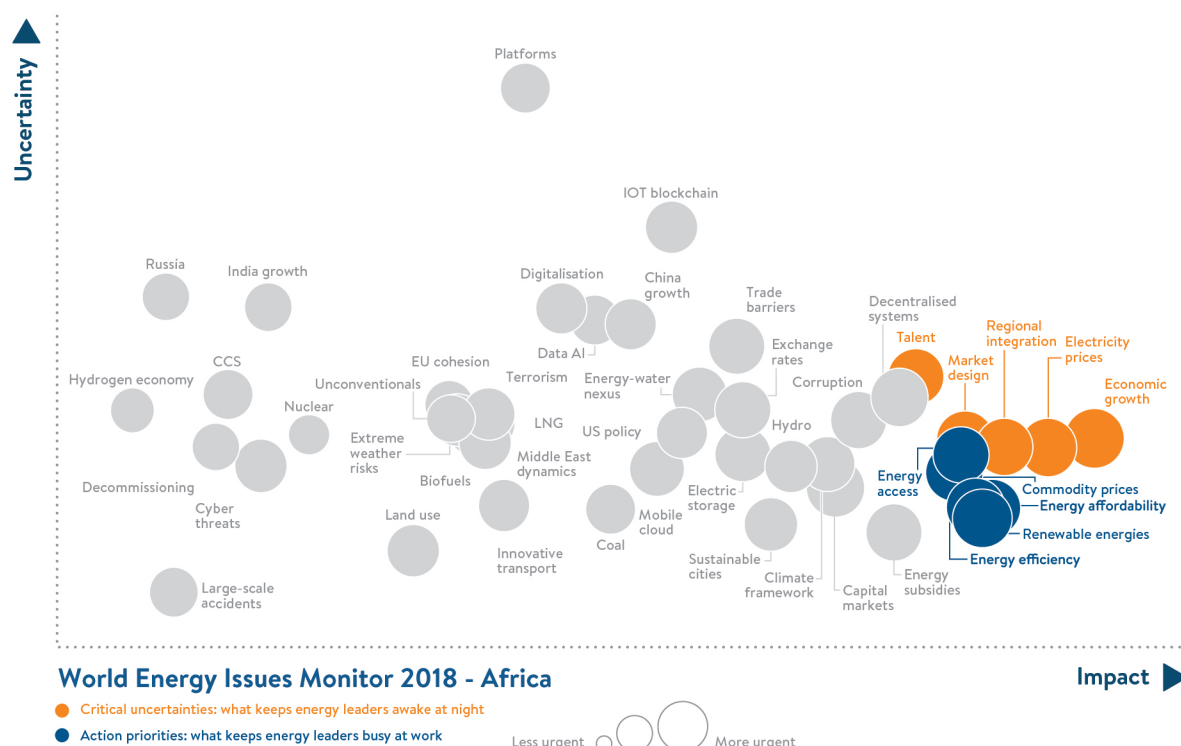
We have all six regions of the world represented in this year's edition. Currently, 38 countries provide the basis for the global issues map. In the near-term, we are striving to include all member countries in future publications. We are also committing ourselves to broaden the survey participation to include new voices of new energy shapers within and beyond the energy system.

Assessing the energy agenda for Africa

AFRICA
BOTSWANA
CAMEROON
KENYA

NAMIBIA
NIGERIA
SOUTH AFRICA

AFRICA



Energy poverty, electricity prices, energy efficiency and infrastructure are among key challenges facing African countries. Energy access appears as the ultimate goal that should drive most in the continent from poverty to prosperity. Sub-Saharan Africa is challenged by the world's lowest level of electricity access (35% overall, and only 19% in rural areas) and is home for more than half the world's population without access (632 million people or 53.5%). The region is focusing its attention on the following issues:

Renewable Energies keep a high impact on the African agenda and is expected to increase in roll-out (for power generation in grid-connected areas and in remote communities). Substantial developments have been recently made in leading countries forming the breakthrough of Renewable Energy transition in Africa. Nevertheless, there are still some key challenges to address for the development of variable renewable energy sources, including enabling policy frameworks, adapted regulations, access to adequate finance, as well as strong support from governments and other policymakers.

Regional energy integration and interconnection continue to be appealing for key action priorities, because they offer huge opportunities on a regional and national scale. Regional energy integration and interconnection also remains high in the agenda and are key priorities for African energy leaders and organisations. Progress on most regional energy integration projects has remained very slow over the years. Investment in transmission projects to link grids is expected to increase substantially and more efforts are being made to develop bankable projects that will attract private sector investments.

Market design is positioned almost between the uncertainty and action priority areas. Governments and industries are keen to further expand access to markets to finance energy projects and infrastructure. Designing and implementing efficient electricity markets is key to the success of the African Union objectives of achieving Free Trade African market (2017), Africa Customs Union (2019) and African Common Market (2025).

Climate change framework navigated disparately, after being perceived initially with high uncertainties in the Issues Monitor, and finally converged into the action priorities area with great impact, during the two last years.

All African countries have signed the Paris Agreement, but only 8 countries are ready to use their own resources to move ahead about their NDCs (Nationally Determined Contribution) implementation, while the others are conditional upon financial support from the International community. It is expected that the AfDB NDCs Hub, as a catalyst for concessional funding, would offer the opportunity to accelerate financing for Africa climate action through NDCs.

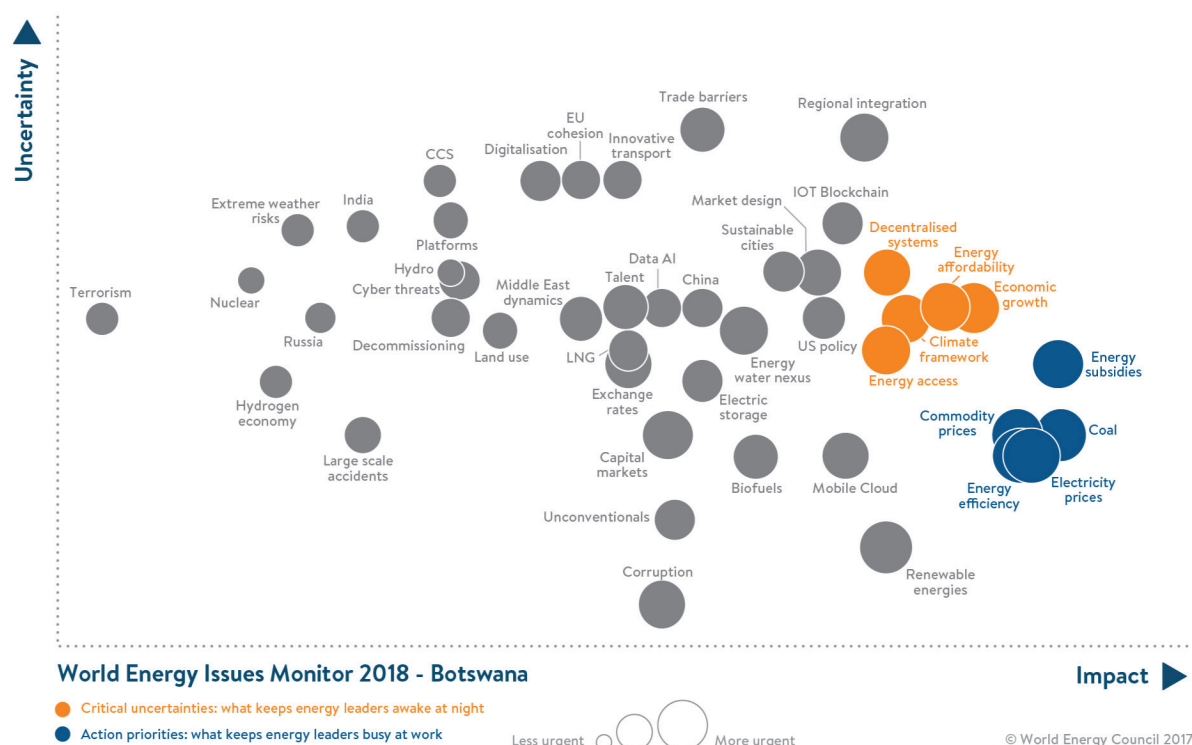
Decentralised systems are gaining greater impact this year, although in the areas of high uncertainties. It is clear that they can deliver socio-economic dividends faster and at lower costs than the conventional past solutions and can offer an attractive option for closing the energy access gap rapidly, especially for remote and rural areas.

To further sustain their development, robust actions should be put on their use, with much focus on renewables energy supply. Moreover, the policymakers need to evolve regulatory frameworks to integrate new opportunities and respond to evolving options for their sustainable use.

Energy Efficiency maintains its position with high impact and great urgency, and moves to action priority over the two last years, because perceived as an indispensable and critical tool for the energy system, requiring pressing and bold actions to reap the benefits of this major but “hidden fuel”.

New lighting technologies, energy-efficient appliances, use of renewables, and improvement of energy efficient standards and labelling have all contributed to substantial reductions of energy use in residential and commercial sectors. There are challenges in the transportation, industrial and power sectors. Awareness, education, assessments, access to adequate financing, regulations and effective policies would contribute to make more progress and encourage savings.

BOTSWANA



NATIONAL OVERVIEW AND CONTEXT

The Issues Monitor continues to map the concerns of Botswana's energy sector and this year's instalment continues this process. The following concerns are regarded as key factors which have in the past affected the energy sector and some are likely going to continue affecting the sector in the absence of strong interventions: dependency on imported energy products; minimal use of renewable energies; access to clean energy; lack of statistics to guide policy formulation; lack of energy prices and tariffs and energy efficiency.

» In October 2016, the then Ministry of Mineral Resources, Energy and Water Resources was restructured and renamed Ministry of Mineral Resources, Green Technology and Energy Security, this was meant to emphasise and refocus the future efforts of the Ministry to energy security.

KEY ISSUES FROM THE NATIONAL MONITOR

Being a Party to the UNFCCC (United Nations Framework Convention on Climate Change), the Government of Botswana has made some significant strides towards responding to the challenges posed by climate change. For instance, the country prepared the **Second National Communication (SNC) report in 2004**. The SNC quantified the national GHGs emissions which were estimated at 5272 Gg of CO₂ equivalent. The assessment identified the energy sector (stationary and the mobile sources) as the major emitter constituting over 90% of the total emissions.

The decline in **economic growth** following an important development phase after independence (1966) has been an issue of concern. On the energy front, the decline has resulted in lower rates of energy products (electricity, coal etc.) and consequently under-employment as employees and limited salary increase. This has been a cyclical event which is keeping the leaders engaged on how the economy can be diversified to regain its initial growth rates.

The introduction of the National Electricity Standard Connection Programme has assisted households to connect to the national electricity grid at a uniform **subsidised** cost of BWP5, 000, importantly contributing to **electricity access**. Also, the introduction of village electrification projects has improved the living standards of the rural populace. Provision of electricity to rural areas is part of the Government's effort to promote rural development as the setting up of new business is facilitated by the availability of electricity and increase economic growth. The government will continue to electrify villages to increase the rate of access to electricity and improve the living standards of people.

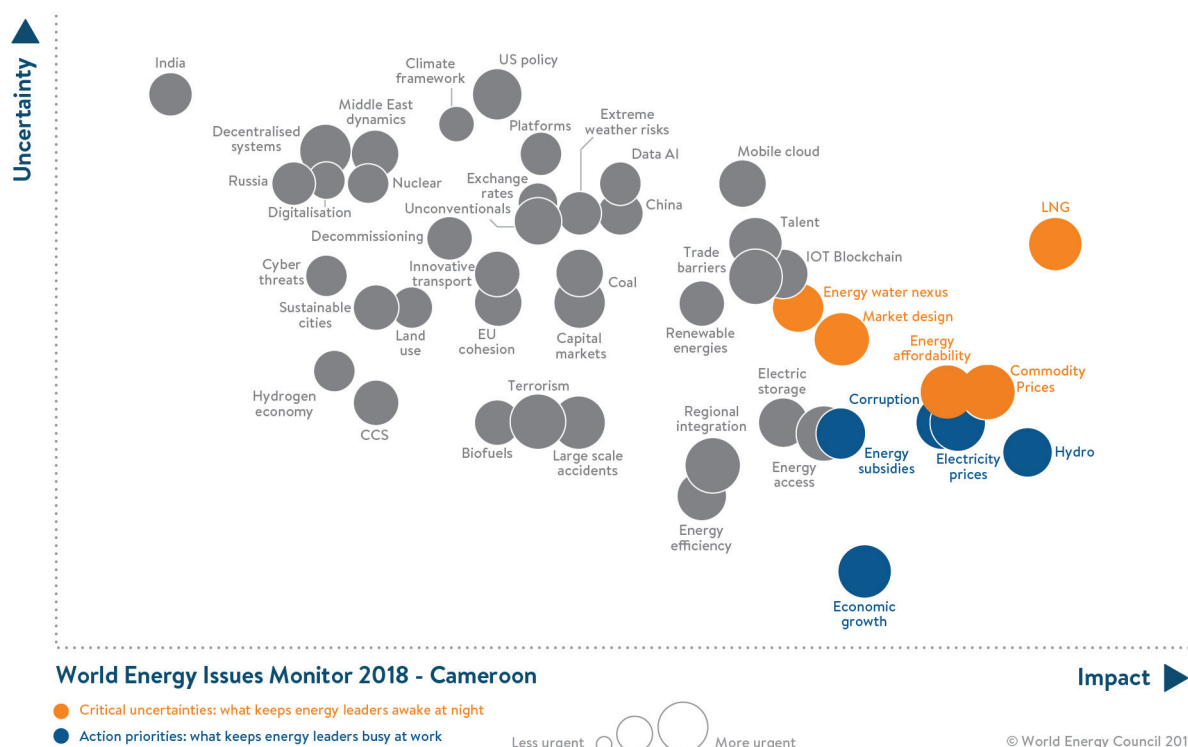
Tariffs are not cost reflective and are the lowest in the SAPP (Southern African Power Pool) area. Looking at the country's current power situation the non-cost reflective tariffs are still relevant to enable growth and enhance the **affordability of electricity** in rural areas. For the end user, there are two **tariff pricing** models, depending on the household or domestic consumption. When purchasing electricity, the first 200 KWH units have a lower price. Additional consumption is subject to a price increase per KWh.

To mitigate the high cost of both electricity and petroleum product imports, the Government of Botswana is keen to improve **energy efficiency** at the national level. This is reflected in Botswana's 10th National Development Plan which targets "efficient utilisation of energy in buildings, transport and industry, promotion of energy efficient equipment, and the development of policy and legislation for demand-side management including price as a regulator of demand". Improved energy efficiency is also viewed as a positive means of contributing to Botswana's international **climate change** and carbon emission obligations.

CONCLUSION

Rural electrification along with safe and affordable access to energy is a key priority for Botswana to support economic growth. Diversification and decentralisation of the country's energy mix through renewables integration are important aspects in achieving these priorities. Investments in energy efficiency projects will also pave the way for stable affordable energy while also reducing carbon emission.

CAMEROON



NATIONAL OVERVIEW AND CONTEXT

Cameroon's oil sub-sector remained resilient to the global oil crisis while the electricity sub-sector remains characterised by a fragile balance between demand and supply, resulting in frequent outages. Energy consumption is one of the lowest globally, at 342 kg of oil equivalent per capita; electricity access has been assessed as 54% nationally (88% in urban and 17% in rural areas). The country's energy mix shows no perceptible change, dominated by biomass (73%), fossil fuels (20%) and hydro (7%). Other renewables contribute less than 1% to the mix¹.

» In 2017, the African Development Bank Group (AfDB) approved a loan of €150m to help finance the 420 MW Nachtigal hydroelectric project. Nachtigal will come online in 2022, increasing existing installed electricity capacity by 30%, helping to lower electricity costs in the long-term.

KEY ISSUES FROM THE NATIONAL MONITOR

In 2014 the Société Nationale des Hydrocarbures (SNH) re-evaluated Cameroon's natural gas reserves, indicating a total of 157 billion cubic metres, up from 144 billion m³ previously identified. The potential of the resource makes **LNG** a top issue of critical uncertainty for energy leaders. A flurry of activity can be observed in the gas sub-sector, with production in the Sanaga South and Logbaba fields growing, which led to the opening of the very first Sub-Saharan natural gas processing plant in November 2014 in Douala².

1 - Ruppel O, Ndongsok D. State of Electricity Production and Distribution in Cameroon. Yaoundé, Cameroon; 2017. http://www.kas.de/wf/doc/kas_50984-1522-1-30.pdf?171206175612

2 - Fortune of Africa. Proven oil and gas reserves in Cameroon <http://fortuneofafrica.com/cameroon/2014/01/31/proven-oil-and-gas-reserves-in-cameroon/>. Published 2016. Accessed April 20, 2018

High uncertainty associated with the **mobile cloud** represents a state of ongoing change observed across many sectors since 2015, brought on by expanding mobile connectivity. Online billing and payments, and new partnerships between energy companies and mobile operators are still developing, changing the landscape of the sector. The issue of **talent** scarcity is permanently viewed as a hindrance and a cause of mismanagement.

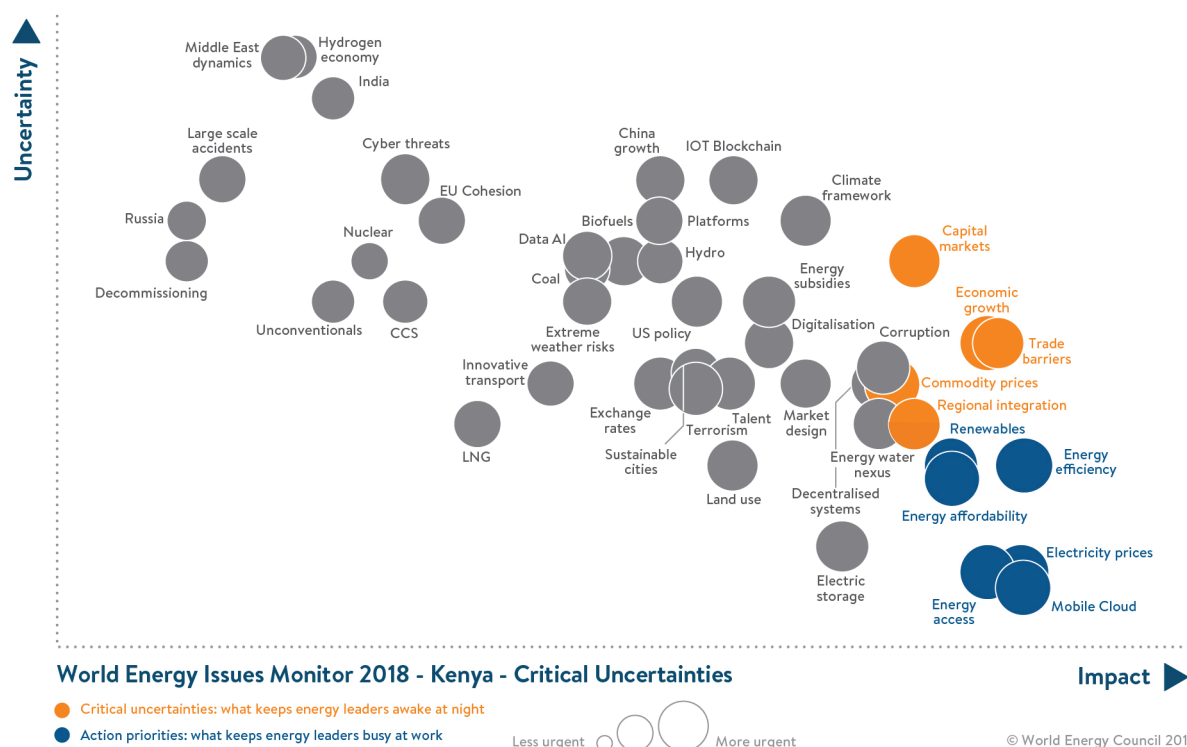
Cameroon's goal to become an energy exporter, outlined in the 2035 Development Strategy, is a key priority for energy leaders. In this way the energy sector will play a major part in boosting economic growth.

In urban areas, access to electricity is additionally hindered by its unaffordability, which makes **electricity prices** a priority for action. Price reduction can be realised through the eradication of **corruption** and development of new **hydro-power** capacity to increase supply; hence, these issues are reflected as the top action priorities for energy leaders in Cameroon, as highlighted in this year's Issues Monitor.

CONCLUSION

Overall, Cameroon's energy sector has remained stable for the last two years, though significant issues remain. The key aspects to watch in 2018 will be the impact of anticorruption initiatives on economic growth, as well as progress along the government's 2010 policy direction – lower electricity prices and increased access through the development of additional hydro-power capacity. The sector will be impacted by the new electricity framework and market design, while new trends will be observed in oil and gas in the context of re-evaluated LNG reserve.

KENYA



NATIONAL OVERVIEW AND CONTEXT

In 2017, Kenya's rate of economic growth decelerated by 0.5% from the previous year's forecast to 5.5%. Reasons for this included the political situation in the country due the general elections¹, the negative impact of a prolonged period of drought on Kenya's predominantly agricultural economy, and reduced production from small and medium enterprises (SMEs) - these have faced challenges for capital access² following a government policy which led to the capping of interest rates that banks used to provide loans. The Kenya Association of Manufacturers reported that 47% of manufacturers will be cutting jobs in 2018³; this could indicate reduced productivity, and in turn reduced energy demand.

» Decentralised solutions, such as solar home systems have played a large role in promoting modern energy access in Kenya. In 2017, it was estimated that approximately 3 million households not connected to the electric grid or with an unreliable electricity supply had acquired new solar home systems⁴.

KEY ISSUES FROM THE NATIONAL MONITOR

Both the government and private sector have used debt financing for the development of energy infrastructure (both on and off-grid). Independent Power Producers in Kenya have taken advantage of feed-in-tariffs which guarantee them payment at a pre-determined rate per kWh. These agreements have provided a stable and enabling environment for development. Investors, however, still face challenges⁵ in **accessing capital**, making this one of the most critical uncertainties in this year's

1 - www.worldbank.org/en/news/press.../2017/.../kenyas-economic-outlook-to-dip-in-2017

2 - <https://www.cytonn.com/download/The%20Impact%20of%20Capping%20Interest%20Rates%20on%20the%20Kenyan%20Economy%20vFFinal.pdf>

Monitor. The cost of obtaining data needed to demonstrate project bankability can be prohibitive and feasibility studies fall below the standard of the local utility.

Kenya has abundant renewable energy resources and utilises solar, geothermal, wind and hydro for electricity generation, enabled by the Feed in Tariff. The process of obtaining a power purchase agreement can be lengthy, and few lawyers are qualified to conduct it: this acts as a **trade barrier** (i.e. enabling green growth) to investment in the sector⁶. Moving to energy auctions can help further the development, but local developers have concerns that they will be unable to compete on a price basis with international developers⁷.

Kenya is the largest market for solar home systems in sub-Saharan Africa⁸, which play a unique role in promoting **energy access** for low income households. It has been driven by the Pay As You Go financial model, the presence of a **mobile cloud** money system and high penetration of mobile phones. Concerns have been raised about the quality of these products, with only 50% having certified to global lighting standards⁹: implementing national standards will promote access to quality solar PV products. The government is implementing the Kenya Off-grid Solar Access Project to promote electricity access in counties that are underserved by the grid, having identified renewables as the optimum solution. Considering the recent devolution of Kenya's governance, county administrators need training on policy, operation and management of off-grid energy systems. This actively developing renewable, efficient and mobile energy access environment is illustrated by the clustering of high impact action priorities on this year's Issues Monitor map.

The government is in the process of implementing regulations which will require solar water heaters to be installed where consumption exceeds 100 litres, reducing the use of energy from the grid for heating. A priority action on **energy efficiency** is involving public participation in the policy implementation, and educating the public on its importance.

CONCLUSION

Access to electricity in Kenya has evolved from an uncertainty to a clear ongoing action, and has steadily improved from 20% in 2012 to 65% 2016¹⁰. This has been due to projects such as the Last Mile Connectivity Project which aimed to connect people living at a distance of 600m or less from the grid at a subsidised rate. Energy affordability remains a topic requiring action, with anecdotal evidence that end-users are unable to afford the costs of grid electricity consumption. Even with the Pay As You Go financial model, poor people are still unable to afford solar home systems.

Access to clean cooking conditions remains a challenge with 75% of the population still reliant on solid biomass. Emphasis needs to be placed on the development of efficient and affordable cook-stoves and financial models that can allow people to transition to modern equipment.

3 - <https://www.standardmedia.co.ke/business/article/2001258217/job-cuts-loom-as-going-gets-tough-for-firms>

4 - https://www.gogla.org/sites/default/files/resource_docs/2018_mtr_full_report_low-res_2018.01.15_final.pdf

5 - <https://ke.boell.org/sites/default/files/2013-03-powering-africa-through-feed-in-tariffs.pdf>

6 - <https://ke.boell.org/sites/default/files/2013-03-powering-africa-through-feed-in-tariffs.pdf>

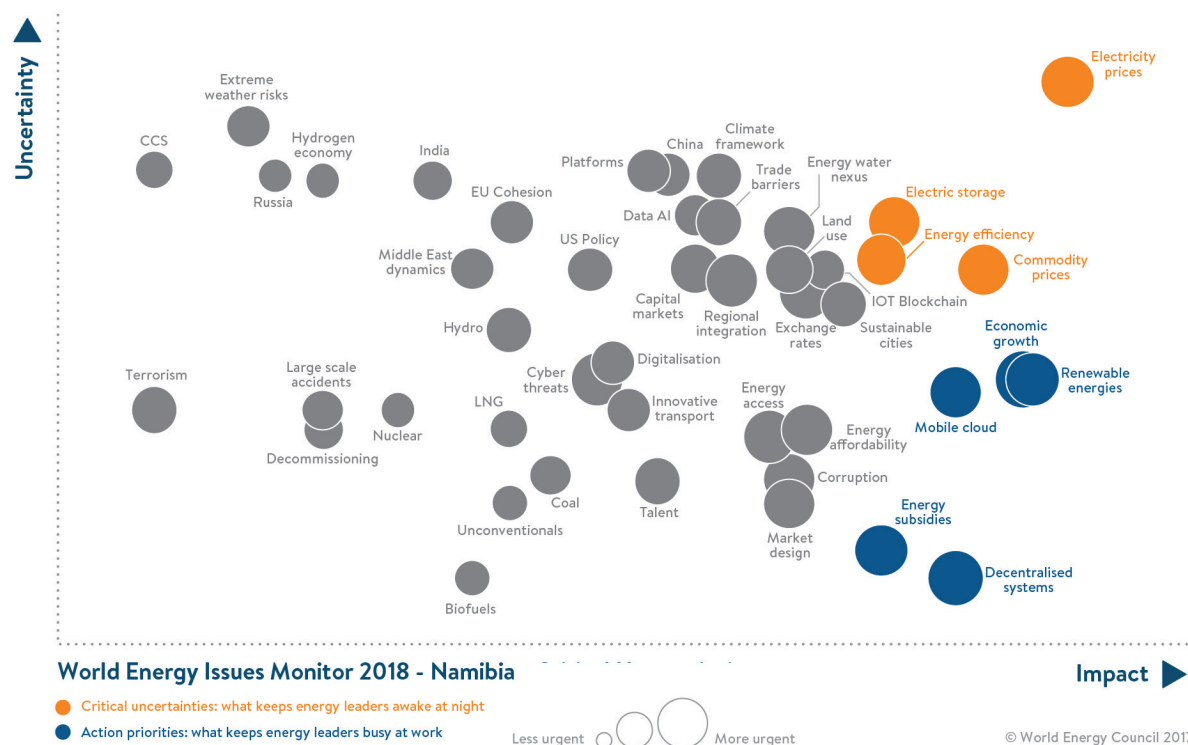
7 - <https://www.kenyaengineer.co.ke/kenyas-energy-security-energy-auctions/>

8 - http://www.iea.org/publications/freepublications/publication/WEO2017SpecialReport_EnergyAccessOutlook.pdf

9 - <https://www.kenyacic.org/sites/default/files/publications/KCIC%20Solar%20Survey-3.pdf>

10 - http://www.iea.org/publications/freepublications/publication/WEO2017SpecialReport_EnergyAccessOutlook.pdf

NAMIBIA



NATIONAL OVERVIEW AND CONTEXT

Namibia imports most of its electricity from South Africa and Zimbabwe. The National Integrated Resource Plan (NIRP) a twenty year development plan for Namibia's electricity supply industry was commissioned in 2011 and developed in 2013. The plan provided a projection of Namibia's expected future electricity demand in the short-term and long-term, spanning the period between 2016 and 2035.

Historically, Namibia has experienced steep electricity tariff increases in its drive to reach and remain at cost reflective tariff levels, reflecting the long-run marginal cost of supply, and based on economic principles. This situation has resulted in having some of the highest retail tariffs in relation to other counties in SADC (Southern African Development Community), and subsequently remaining on the critical path of uncertainty.

» Namibia is currently gearing up for a renewable energy revolution and has plans to continue to deploy modern renewable energy into the energy mix through grid and off-grid connections. In support of that initiative, the Namibian Government recently developed and released a Renewable Energy Policy (July 2017). This policy outlines specific goals to steer the electricity sector and to promote grid-connected and off-grid renewable energy development.

KEY ISSUES FROM THE NATIONAL MONITOR

Namibia's Issues map has consistently over the past years, recorded **economic growth, renewable energies, electricity prices** and **commodity prices** as critical uncertainties in its energy landscape.

Although these uncertainties feature prominently, adequate progress has been made towards economic growth, through the implementation of government action plan towards prosperity for all Namibians (2016/2017 – 2019/2020). The plan complements the Vision 2030 and Namibia's National Development Plan (NDP 5). All of the three plans set the goals, targets and strategy for Namibia to move on a progressive path to economic prosperity through a concerted effort for the enhancement of Namibia's economic growth. These Plans also include specific growth target milestones and strategies for the sustainable deployment of Namibia's resources to achieve the stated economic and social development goals.

Top action priorities that keep energy leaders busy at work include **energy subsidies, decentralised systems, economic growth** and **renewable energy integration**. Namibia's strides towards addressing these issues include a number of initiatives.

Energy subsidies - As a regulated commodity, electricity lends itself as a vehicle for the targeted distribution of subsidies to low-income households using electrical energy. Of the many approaches available for subsidies, Namibia has opted to make use of innovative tariff structures that incentivise consumers to utilise electricity at different times, and for use of renewable energy technologies, combined with smart home systems. These approaches currently in operation in Namibia include Namibia's Net Metering policy, the National Electricity Support Mechanism (NESM) and the National Electricity Support Tariff.

The Net Metering Policy allows consumers to reduce their electricity purchases from distribution networks through generating electricity for own consumption, at a capacity of less than 500kW. Under the Net Metering Rules, customers with small solar photovoltaic (PV) and micro-wind generators can be connected to the local distribution grids.

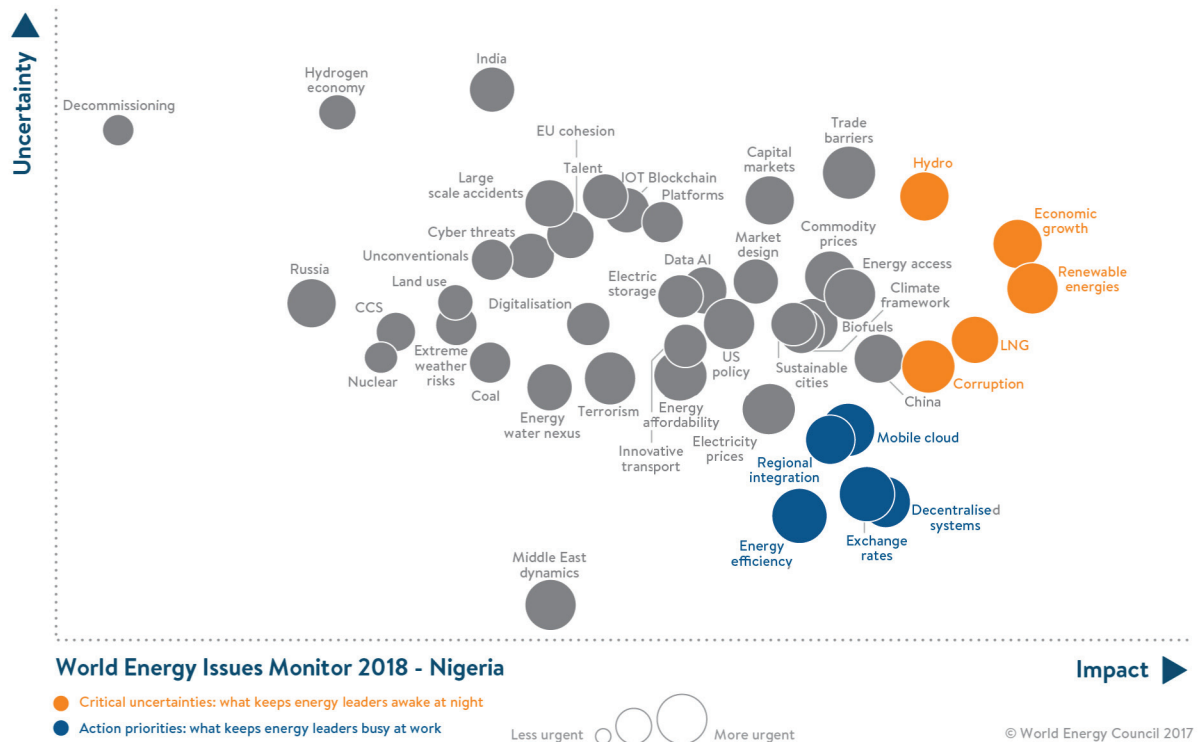
The National Electricity Support Mechanism is designed to offer financial relief to low income electricity consumers through offering a subsidised tariff available on a low capacity connection only. The NESM is designed to assist low income households to afford basic electricity needs. The NESM is based on an inclining block tariff (IBT) for low capacity pre-paid metered (PPM) domestic connections limited to a supply of 15 Ampere, comprising three separate consumption blocks.

Decentralised systems – Decentralisation remains a top priority in Namibia. However, success stories inform that such installations do work and can guarantee basic access needs. Namibia's success stories concern Tsumkwe and Gam, two localities in remote areas with little economic activities coupled with a scarce population have a small solar PV system complemented by diesel generators installed, these installations have helped to boost job creation, computer literacy and business opportunities, supporting the notion that mini-grids drive micro enterprises.

CONCLUSION

The Namibian government is taking a fresh look at the country's overall energy sector policy and strategy. Currently, the government has embarked upon multiple parallel efforts to design an overall energy sector development policy and strategy including (i) the development of a National Energy Policy, (ii) an updated National Integrated Resource Plan (NIRP) to fulfill least-cost energy sector development priorities and targets, (iii) a Renewable Energy Policy, and (iv) a National IPP (Independent Power Plant) Policy. These policies together will drive the overall energy sector development strategy of the country.

NIGERIA



NATIONAL OVERVIEW AND CONTEXT

Nigeria has an abundant hydro-power potential, most of which remains unexploited and its further development is a part of Nigeria's sustainable development goals and Renewable Energy Master Plan (REMP).

Two of the undeveloped hydro-power projects, the Mambilla 3050 MW and the 700 MW Zungaru projects, once finished, will become the country's largest hydro-power plants of recent times. Although works started in 2013, legal challenges and lack of funding have been slowing progress for several years.

KEY ISSUES FROM THE NATIONAL MONITOR

Economic growth is continuously perceived with a high impact in Nigeria. Increased uncertainty on this issue is strongly related to the negative impact of the oil price collapse. Likewise, LNG uncertainties can be associated to the commodity price crisis. This context is of special relevance considered that approximately 90% of foreign exchange income in Nigeria is linked to oil revenues. In line with this environment, exchange rate is in turn perceived as an action priority area, and the Naira's continuous downward trend further aggravates the low oil price environment. The winning administration of the 2019 General Elections will be faced with the need to improve revenue sources, including those from crude oil.

President Muhammadu Buhari has received a reputation for cracking down on corruption, another critical uncertainty in the country. High-powered individuals are currently being prosecuted and it is expected that the issue will consequently lose importance in the coming years.

On the renewables side, there are increased uncertainties around green energies despite the country's large renewables potential, with solar PV topping the list with an estimated potential of 325 TWh if only 1% of the available land is utilised.

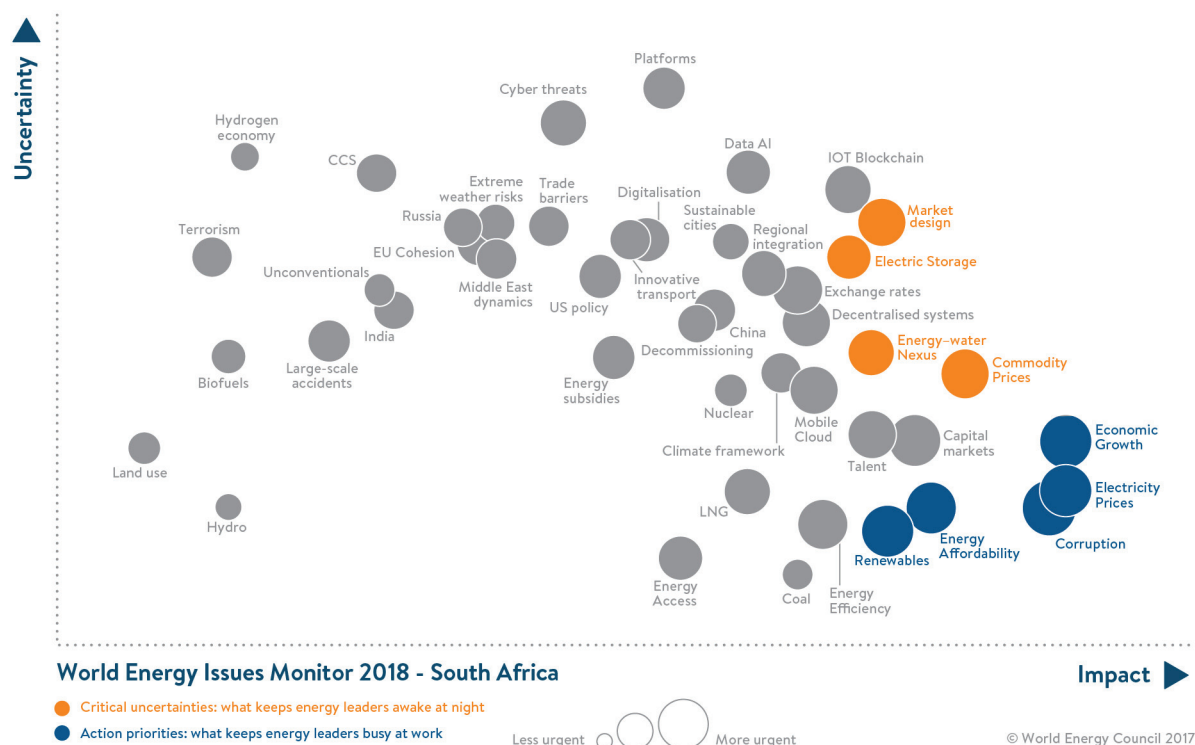
Leaders' attention to improving energy efficiency is an important signal of change for the country's power industry. While mobile cloud is perceived as an action priority, it is interesting to note that the telecommunications industry is positioned to be challenged by power deficiency. This would, in turn, increase the sector's dependence on captive generation with consequent need for additional investments.

Finally, over the past year, regional integration and decentralised systems have increased their importance in the government's agenda for sustainable energy development. Government initiatives to ensure availability and accessibility of energy for all have been key drivers behind this development.

CONCLUSION

With a population of 190 million and a generation capacity of 3,900 MW, energy poverty is still a critical issue for Nigeria. However, the country has abundant energy resources, and its renewables potential can serve as a solution to tackle the power crisis in a sustainable manner. The current political will to crack down on corruption is expected to gain importance and grow as a signal to encourage future investments in Nigeria's power sector in the coming years

SOUTH AFRICA



NATIONAL OVERVIEW AND CONTEXT

Unlike other developing regions in the world, South Africa stands alone in its one whole world dependency on coal generation. Even more startling is South Africa's dependence on low-grade coal, and the country uses coal to generate a fifth of its liquid fuels as well. Over three quarters of electricity supply comes from coal.

» Despite the significant dependency on coal the South African government does have an ambitious commitment to addressing climate change through a determined effort to implement a carbon tax, to replace its aging coal fleet with nuclear, renewables, gas and new coal plants outfitted with carbon capture and storage.

KEY ISSUES FROM THE NATIONAL MONITOR

The economy is closely linked to the mining industry so the issue of **commodity prices** will always be important for South Africa. Given the weakness shown by commodity prices in 2017, and that there was little indication that they would strengthen in the near future, it is not surprising that commodity prices have been rated as the highest uncertainty for South Africa especially due to the lack of growth in the economy.

South Africa has been experiencing severe drought over several years in different parts of the country and agriculture is an important contributor to both the economy and job creation. So the issue of water is a concern and an uncertainty. The level of concern and uncertainty is exacerbated given

that much of the energy generation in the country is by standard wet cooled power plant which need large volumes of water to operate. When these two aspects are combined, the **Energy-water nexus** becomes an important uncertainty to consider.

The current market design is controlled by Government through policy and monitored by NERSA, the government regulatory authority. This current design gives power to the national utility and with the initial success of the IPP programme and the reduced costs of renewable energy, there is pressure on Government to restructure the market to reduce the national utility's market power. This then explains why **market design** is amongst the top uncertainties.

In 2017, it was still not clear that **electric storage** could be commercially viable but it was recognised as being a critical element to the future success of more renewable energy in the generation mix to manage its intermittent nature. This situation then placed electric storage at the high level of uncertainty, as it emerges from the study.

During 2017, South Africa experienced very slow economic growth and a political environment in which the extent and level of corruption became more visible. Both aspects were major factors that led to the investment downgrading of South Africa during 2017. It is then quite understandable that **economic growth** and **corruption** were identified in the study as issues where action is needed to address them.

In addition, **electricity prices** continued to increase at above inflation rates while a weak currency resulted in liquid fuels being more expensive. As result one understands why electricity prices and **energy affordability** both feature high in the issues that need action.

Finally, **renewables** is also high on the action list due to the stalling of the Renewable Energy Independent Power Producer Procurement programme (REIPPPP) which was initiated in 2011. The national utility was not willing to sign the PPAs for the participants in the last bid windows of the programme since it now has excess power relative to demand. The reason for this situation is that low economic growth and general stagnation of industrial and manufacturing growth in South Africa has resulted in the demand for electricity not increasing at the expected rate.

CONCLUSION

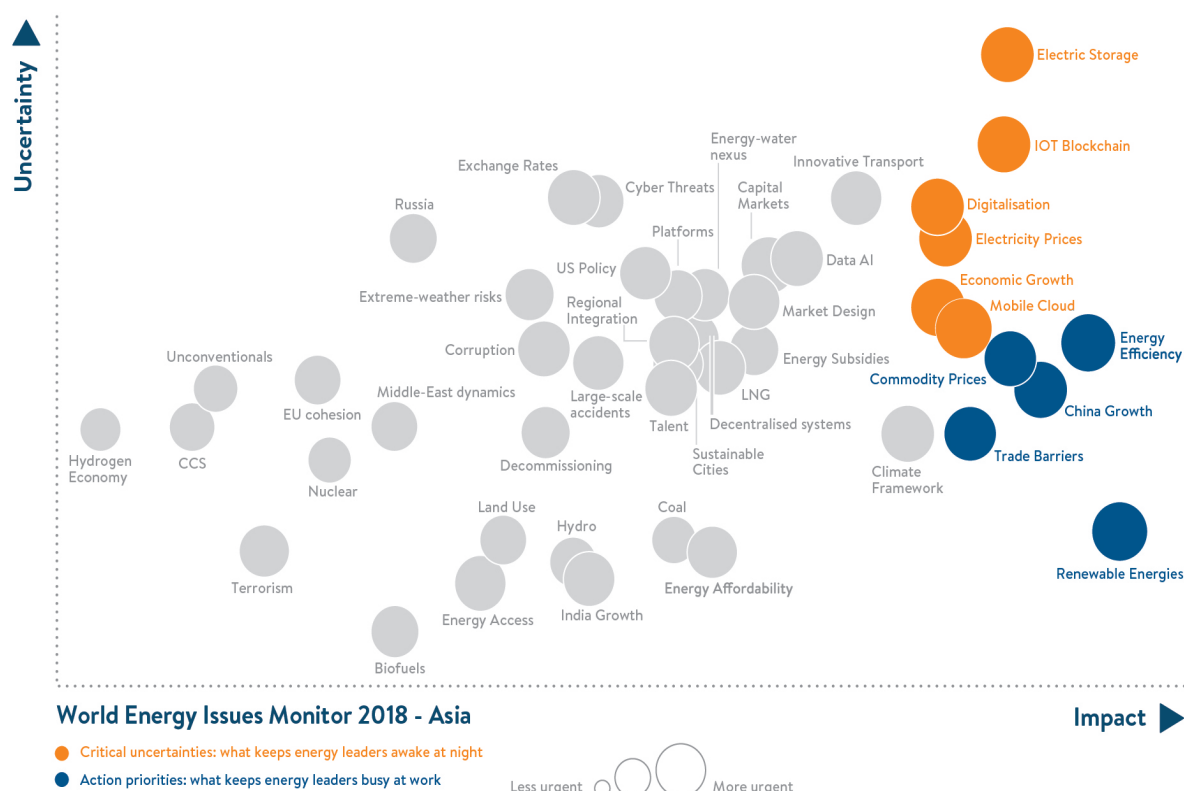
South Africa is adopting enabling policies to increase the share of renewable energy in the national energy mix. The more feasible resources of renewable energy in South Africa are solar and wind.

Assessing the energy agenda for Asia

ASIA
CHINA
INDIA

JAPAN
MALAYSIA
NEW ZEALAND

ASIA



World Energy Issues Monitor 2018 - Asia

Impact ►

Asia is home to two of the world's renewable growth leaders, China and India, according to the World Economic Forum. Consequently, according to the responses of Asian energy leaders to the latest Issues Survey, it is hardly surprising that **electric storage** is emerging as a high uncertainty. **Innovative transport** also emerges as a critical uncertainty, in parallel with energy storage. These two shifts symbolise the view within the Asian energy community that there will be a significant increase in EVs (electric vehicles) and their expansion in the Asian market, particularly in China and India. Energy storage is also the key technology for decarbonisation and decentralisation through increasing introduction of intermittent renewable energies.

In 2017, China, Japan and South Korea held their fourth energy conference. The conference was titled "Toward a New Energy Paradigm: Challenges and Policy Direction of Northeast Asian Countries." Specifically, the conference dealt with problems regarding the desirable energy mix for the three countries, renewable energy promotion and initiatives and challenges for natural gas use expansion. Attendees also discussed their countries' policy initiatives to achieve the voluntary targets submitted to the United Nations for reducing greenhouse gas emissions as an outcome of the Paris Climate Accord. The parties voiced concern about whether US actions would contribute to the stabilisation or destabilisation of the world and how they would influence energy and environmental issues in the world and in Asia. These two unknowns create great uncertainty for Asia, particularly China, Japan and Korea, and could have a domino effect across the region.

According to the Issues Survey responses, the positions on the Issues Map of both **China growth** and **commodity prices** have shifted downwards, showing that while concerns over these two issues are

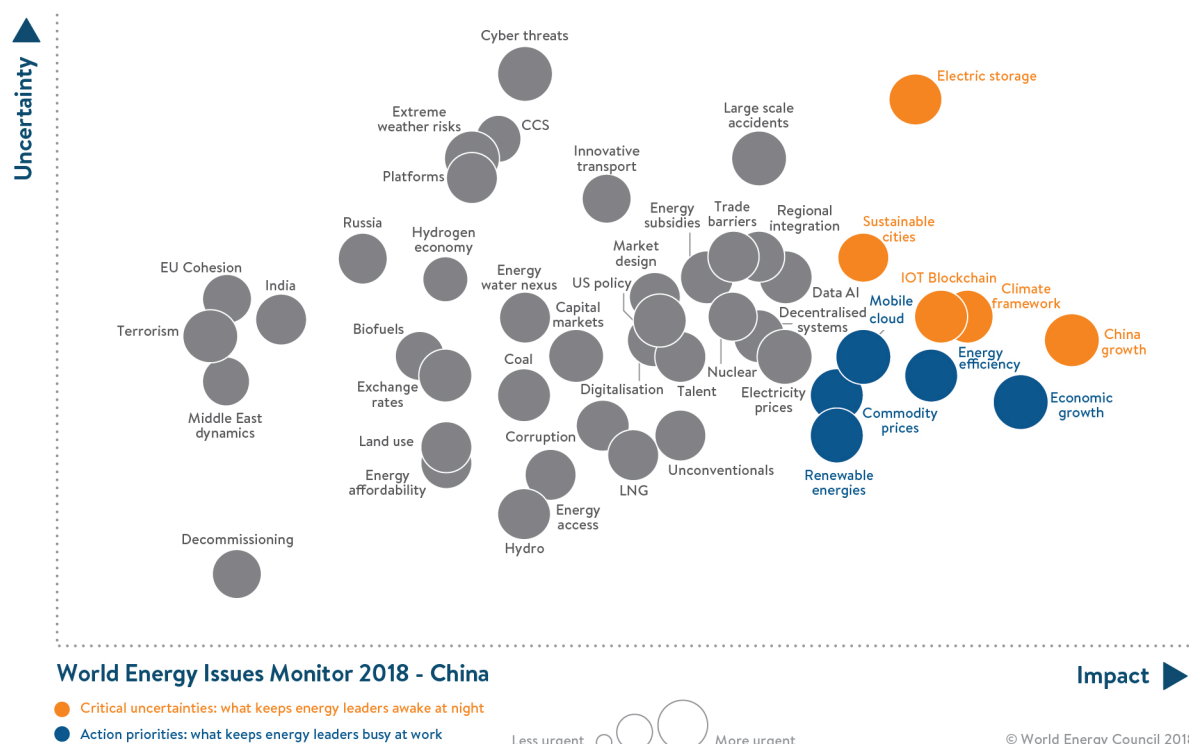
still high, the uncertainty about them is less critical compared to the previous year; this is likely due to factors such as the low volatility of energy prices. **Renewable energies** and **energy efficiency** have greater impacts, reflecting the remarkable increase of renewable sources and the steady growth of energy demand in this region. For the Asian energy community, it is important to make broad and wide-ranging approaches to focus not only on these two issues but to tackle related issues, such as electric storage, trade barriers and innovative transport.

Both **extreme weather risks** and **coal** are moving into the weak signals quadrants, and **nuclear** remains in almost the same position as last year. However, it should be pointed out that in some Asian countries, coal still plays a major role for the time being, and as far as nuclear is concerned, China is vigorously promoting nuclear power. Some Asian countries are planning to utilise the technology, and nuclear remains an important solution for decarbonisation in Asia as a way to address the growing energy demand.

Lastly, **climate framework** has shifted from the quadrant of high uncertainty to the quadrant of implementation. Although there is a possibility of the withdrawal of the US from the Paris Agreement, almost all Asian countries have already submitted their INDCs (Intended Nationally Determined Contributions) and are ready to take the necessary measures to meet their own GHG (Greenhouse Gas) targets. This strongly suggests that Asian energy leaders are accelerating their actions to mitigate climate change and move towards a low carbon society.

Finally, geopolitical risks have rapidly grown more important, particularly in Northeast Asia, with North Korea's nuclear and ballistic missile development negatively affecting regional stability.

CHINA



NATIONAL OVERVIEW AND CONTEXT

China's 13th Five Year Plan for Economic and Social Development (2016-2020) unveiled in March 2017 includes a set of clean energy related objectives, with clear targets for energy consumption cap and a 15% goal for the share of non-fossil-based energy in the country's primary energy mix.

» The 13th Five Year Plan for 2016-2020 highlights a strong intent to “move ahead with the revolution in energy consumption”¹, with a re-focus on high-quality development and an explicit aim to move away from the long-used rapid growth model.

KEY ISSUES FROM THE NATIONAL MONITOR

In 2017, similar to the past 5 years, the level of uncertainty around **Climate Framework** has remained the same for China's energy leaders. Issues such as predominant coal infrastructure and the increased demand for better performance vehicles (which are usually fuelled by oil) are some of the causes preventing confidence around this issue to grow. A particular feature, in 2013 a five-year action plan was launched to bring down pollution levels in northern China. Despite its success in reducing air pollution levels over the cold period, the plan's implementation faced severe challenges as the removal of coal-heating equipment wasn't followed by replacement with affordable and efficient clean energy infrastructure in time for winter. As a result, many localities were forced to backtrack and allow flexibility to use coal to provide for basic heating needs².

1 - The 13th Five-Year Plan for Economic And Social Development of the People's Republic Of China (2016-2020)

2 - China's winter air pollution strategy, Economist Intelligence Unit, 15 March 2018

3 - China storage market growing, but electric vehicles still dominate battery demand, PV Magazine, 19 October 2017

4 - Electric cars: China's battle for the battery market, Financial Times, 5 March 2017

5 - What's the future of blockchain in China?, World Economic Forum, 11 January 2018

6 - No Joke: China Is Building 285 Eco-Cities, Here's Why, Forbes, 1 September 2017

7 - The 13th Five-Year Plan for Economic And Social Development of the People's Republic Of China (2016-2020)

On the technology realm, **electric storage** continues its ascendance towards greater impact and uncertainty for China, a trend driven by the growing role of electric vehicles in the national economy. Electric Storage Systems imports increased by 80% year on year in 2016, 60% of which was supplied to electric-vehicle manufacturers³. At the same time, China's investors are heavily venturing in the battery manufacturing opportunity, which benefits from supportive policies and growing access to raw materials such as cobalt and lithium⁴. 2017 has also seen a renewed approach towards **IOT Blockchain** as China launched the Trusted Blockchain Open Lab, promoting the exploration of this technology while maintaining parsimony in cryptocurrencies issue and trade⁵. Other promising development towards incorporation of Blockchain is China State Grid Corporation's expression of interest to explore the tool to advance its plans for an "Internet of Energy."

China targets for its near future is to have over 50% of its new urban developments labelled as "eco," "green," "low carbon," or "smart"⁶. Although the plans for **sustainable cities** are set, fast urbanisation and greater societal demand for higher living standards have challenged planners to accelerate urban improvements and infrastructural development to the detriment of a consistent high standard for the eco-label. Still, China is officially expressing commitments to making "comprehensive efforts to promote energy conservation in industry, construction, transportation, public institutions, and other areas"⁷. As a matter of fact, the actions towards improved energy performance backtrack to 2015 when the **Energy Efficiency** Leader Scheme put in place a mechanism to incentivise higher efficiency standards for appliances industry and buildings⁸.

On the traditional fuel perspective, the increase in **crude oil prices** has contributed to reduced uncertainty. Leading state-owned companies such as Sinopec have improved performance with a 19% rise in net profit to US\$11.2bn reported in 2017. Likewise, PetroChina's profit tripled to US\$3.6bn in 2017, crediting the jump to rising fuel oil and **gas prices**, as well as optimised production and operations, cost reduction and higher efficiency⁹. The role of gas is of particular relevance as China's plans to move away from coal. The country is expected to become the world's top LNG importer by 2030 and is already signing significant agreements such as the CNPC-Cheniere long-term LNG deal for 1.2m tonnes of LNG annually between 2023 and 2043¹⁰.

The **China Growth** issue maintains a moderate level of uncertainty but with an increased impact. Indeed, the issue bridges smoothly with **Economic Growth**, the most impactful action priority in this year's China Monitor. During the 19th National Congress of the Communist Party of China held in October 2017, President Xi Jinping outlined China's change of focus from a rapid growth model to one more focused on high-quality development, which for the energy industry means a renewed emphasis on quality, efficiency and sustainability of development with pollution tackling as one of the key concerns¹¹.

CONCLUSION

China's emphasis on tuning down the role of coal in the energy mix, increasing the renewable capacity and advancing energy technology shows a notable determination on the climate challenge as well as a stronger role in the energy space. The approach to tackling efficiency and sustainability will be crucial to determine the face of the Chinese energy industry in both the domestic and international landscapes.

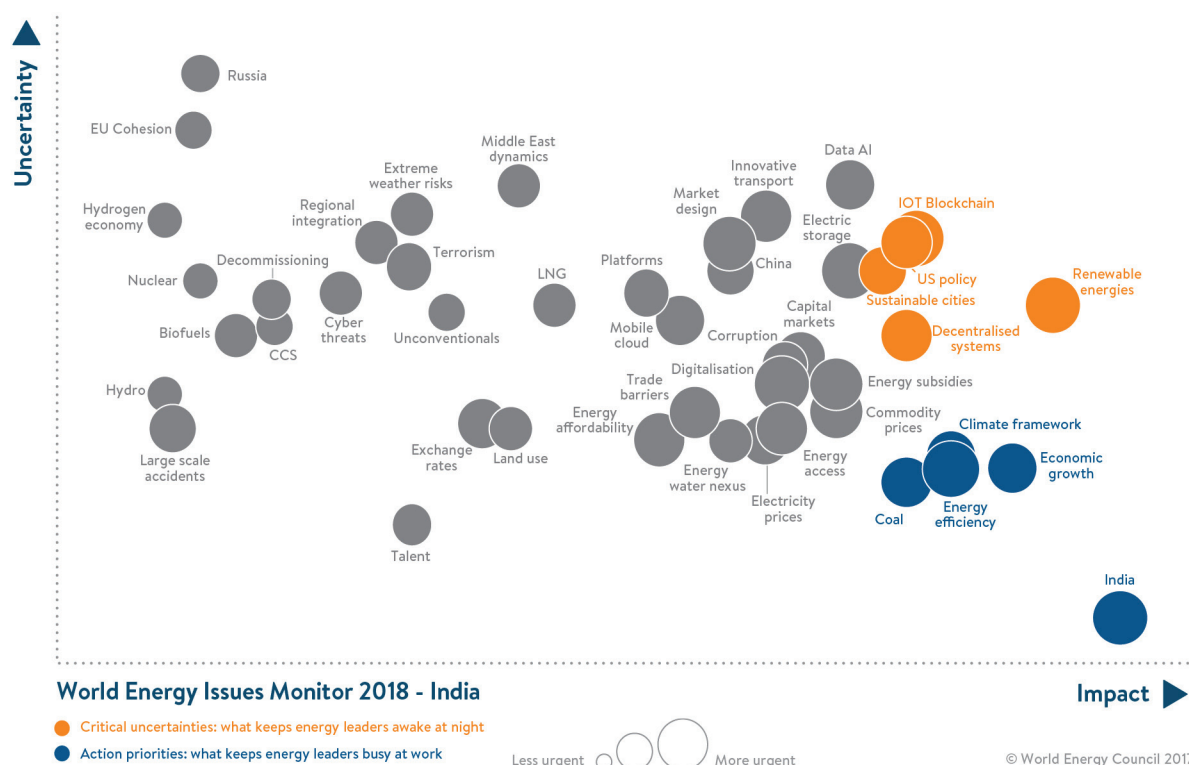
8 - Energy Efficiency Leader Scheme, IEA

9 - PetroChina's Tripling Profit on Higher Oil Misses Expectations, Bloomberg, 30 January 2018

10 - Cheniere Energy seals long-term LNG supply deal with China National Petroleum, Financial Times, 9 February 2018

11 - China's Economic Growth Remains Intact as Party Leaders Meet, Bloomberg, 19 October 2017

INDIA



NATIONAL OVERVIEW AND CONTEXT

Coal is vital for India's electricity security given that over 80% of electricity generation is coal based¹. It is also critical in providing the balancing power and flexibility as more renewable energy generation is integrated. Ensuring quality and availability of coal and implementing the stringent emission norms is important. At the same time, India is also working to incorporate renewable energies into its supply mix. The country has a high renewable energy target 175 GW by 2022² and 275 GW by 2026-27³.

» The dominance of centralised generation would continue into the foreseeable future for India. India has established a target of 40 GW of solar rooftop by 2022. The manner in which the 40 GW⁴ target of solar roof top segment develops will mostly shape the renewable energy decentralised generation space. A significant deterrent is the low level of tariffs for domestic consumers.

KEY ISSUES FROM THE NATIONAL MONITOR

Renewable energies are a critical uncertainty for India because resources are concentrated in a few resource-rich states; mostly in the western and southern regions. Further, the electricity sector falls under concurrent list of the constitution and administered by both Central and State Governments. Integrating large renewable energy capacities in such a scenario has its own technical and policy challenges. Establishing sufficient domestic manufacturing base for solar cells, modules and for

1 - http://www.cea.nic.in/reports/monthly/generation/2018/March/tentative/opm_01.pdf, http://www.cea.nic.in/reports/monthly/generation/2018/March/tentative/opm_11.pdf

2 - <https://mnre.gov.in/file-manager/UserFiles/Tentative-State-wise-break-up-of-Renewable-Power-by-2022.pdf>

3 - http://www.cea.nic.in/reports/committee/nep/nep_jan2018.pdf

batteries is vital for the required self-reliance in energy transition journey as well as for GDP growth. Electric storage reaching its commercial viability is important for management of VRE and for faster adoption of e-vehicles; the issue shows considerable forward movement into the high impact zone of the map in one year (2017-18). This uncertainty associated with renewable energies is also the impetus for why the Issues Map shows **decentralised systems** as an uncertainty. For now, the key indicator is whether India will be successful in meeting the 40GW goal of solar rooftop capacity by 2022. The country's ability to successfully maneuver through its Central and State Governments will be closely monitored by advocates of decentralised systems.

Another uncertainty is the development of **sustainable cities**, as India is rapidly urbanising. In a such a large country context, where urbanisation is taking place without too much planning, implementing sustainable cities is a complex challenge. Multiple programs such as Smart Cities Mission⁵, Mission for Rejuvenation and Urban Transformation (AMRUT)⁶, and the National Heritage City Development and Augmentation Yojana (HRIDAY)⁷ have been created to combat this rapid urbanisation, but the issue remains uncertain until these programs prove successful.

Energy Efficiency is clearly an action space for India. Considerable efficiencies are to be achieved in power distribution and utilisation. The initiatives⁸ Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY) and Integrated Power Development Scheme (IPDS) targeting infrastructure development; Ujwal DISCOM Assurance Yojana (UDAY) with major focus on improvement of operational efficiency and financial turnaround of the DISCOMs; have yielded mixed results. Policy implementation is varied given the concurrent nature of electricity regulation and substantial differences in the fiscal conditions of the states. This is also expected to be compounded by the added financial burden of the UDAY scheme on state budgets over the next few years. Issues of billing and collection efficiency; and suppressed demand need to be dealt with effectively for desired outcomes. Stranded assets in the sector are also perhaps a fall out of the inefficiencies in the power distribution sector. On the Demand-Side Management, there is the successful national LED program with Unnat Jyoti by Affordable LED for All (UJALA) for domestic consumers and Street Lighting National Programme (SLNP). The energy intensive industries are covered under the Perform Achieve (PAT) which is a cap and trade mechanism now in its third cycle covering over 700 entities⁹.

India's rapid growth is probably the most significant action priority as it forms the basis for increased energy as well as a need for a cleaner supply of electricity. As the short-term impacts of major economic measures such as demonetisation and introduction of the unified indirect tax the Goods and Services Tax (GST) phase out, the Indian economy is projected to grow at 7.4 % in 2018 and 7.8 % in 2019¹⁰. National elections are slated for 2019 and continuity of policies is expected. India's growth is very much dependent on continuous electricity supply and requisite data assimilation capabilities which need to be established in order to reap the benefits of IoT and Big Data. Going forward, greater penetration of digitalisation through smart grid/smart metering/ pre-paid meters is expected.

CONCLUSION

Induction and integration of renewable energy capacity as targeted will remain top of the agenda for the Indian energy sector. Improving the efficiencies of the electricity distribution segment is

4 - <https://mnre.gov.in/file-manager/UserFiles/workshop-gcrt-0870616/seci.pdf>

5 - <https://amrut.gov.in/writereaddata/AMRUT%20Guidelines%20.pdf>

6 - <http://mohua.gov.in/cms/smart-cities.php>

crucial. Coal based generation should fully gear up for flexible operation to balance renewable energy supplies meet peak till the time battery storage becomes cost effective. Rapid roll out of charging infrastructure would be crucial in achieving pace in electric vehicle penetration. Domestic manufacture of solar cells/modules and electric storage is needed for self-reliance in energy transition journey, GDP growth and employment generation.

7 - <http://mohua.gov.in/cms/hariday.php>

8 - <https://powermin.nic.in/>

9 - <https://beeindia.gov.in/content/pat-3>

10 - <https://energy.economictimes.indiatimes.com/news/power/india-to-grow-at-7-4-per-cent-in-2018-7-8-per-cent-in-2019-imf/63803862>



» Since Fukushima, the Japanese government's National Resilience Program has been funding measures required for safety and disaster defence, including micro-grids and decentralisation, in Japan's efforts to build a resilient electric grid. In 2017, the program received over \$33 billion in funding: some of this will go towards cities such as Higashi Matsushima building their own micro-grids that can keep the city running for at least three days.

The Issues Monitor correctly depicts two of the most urgent and clear uncertainties for Japan, large-scale accidents and the state of nuclear power. The occurrence of natural disasters and tensioning of North Korea's situation are making uncertainty of **large-scale accidents** even greater. The level of uncertainty is decreasing as some **nuclear power plants** are restarted or are in the process of coming back online. On the other hand, as Japan considers the future of nuclear energy policy, the prospect

of replacement and new expansion needs to be clarified in the reviewed Strategic Energy Plan. To that end, securing public understanding of the energy problem is indispensable.

Another critical uncertainty is **US policy** as it is important for Japan to maintain a close relationship with the US both in terms of politics and also the economy. However, there are uncertainties about the unpredictable implementation of the current administration's America-first principle.

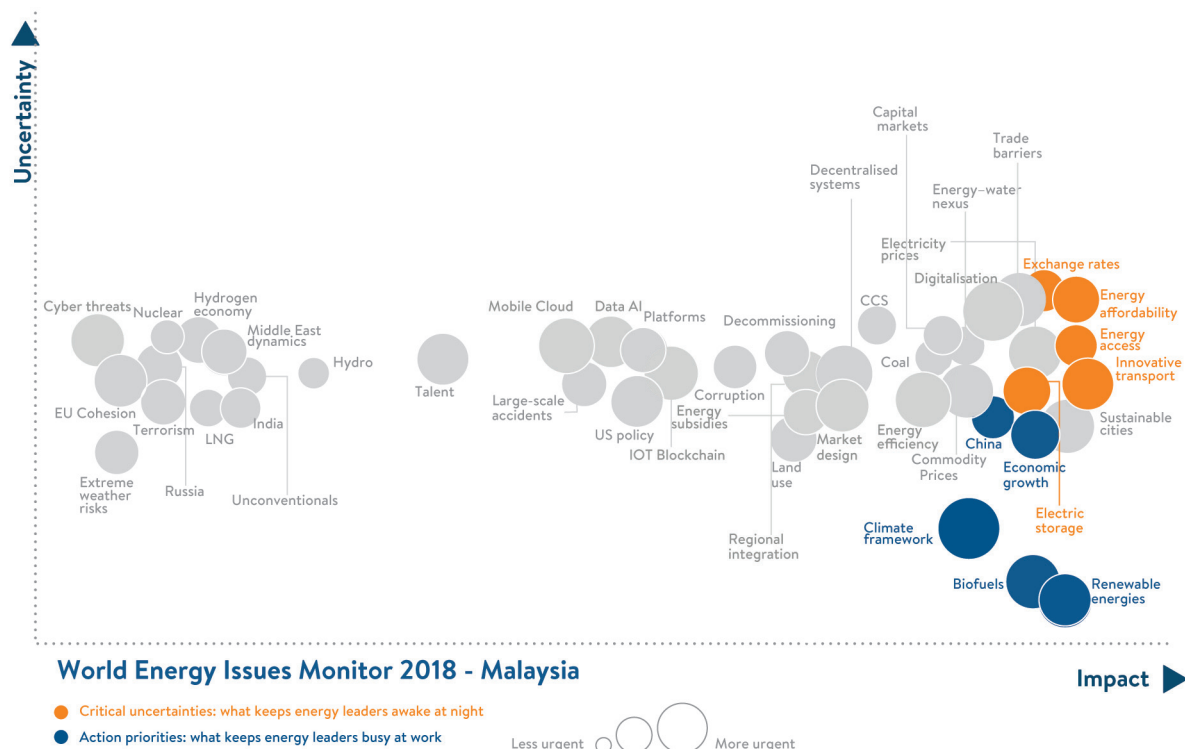
In 2017, Japanese companies and the government focused activities on dealing with various growing challenges, such as liberalisation and climate change. It is essential for the Japanese energy sector to realise technological innovation improving **energy efficiency**, such as **IoT**, **Blockchain**, heat pumps, and the combination of **renewable energies** and **electric storage**.

Japan needs to make effective use of not only LNG but also coal. To deepen the use of **LNG**, which is superior in terms of global warming countermeasures, the following aspects are being assessed: achieving a diversification of suppliers through shale gas import when the price is reasonable, expansion of spot trading, improvement of transaction conditions by deletion of destination provisions and efforts to form a hub by establishing of trading markets are being addressed.

CONCLUSION

The remarkable feature of this year's Issues Monitor map is that the uncertainty of large-scale accidents has increased more than ever, and that consciousness about the necessity of action on energy efficiency is increasing too. On the other hand, an international countercurrent against coal puts Japan in a difficult position in terms of realising future diversification of energy resources.

MALAYSIA



NATIONAL OVERVIEW AND CONTEXT

Malaysia is expecting big changes towards a much healthier, greener direction by 2030. Targets include usage of 100,000 electric cars, 100,000 electric motorcycles, 2,000 electric buses and 125,000 charger stations, an achievement conceptualised by the government. Malaysia's Oil, Gas and Energy (OGE) sector is targeted to grow 5% annually until the year 2020. Deputy Prime Minister Datuk Seri Dr Ahmad Zahid Hamidi said the government had mapped out various policies and incentives to spearhead the growth of the OGE sector as it is one of the key result areas in the ongoing Economic Transformation Programme (ETP).

Malaysia in 2017 has had its fair share of worries over rising costs of electricity generation due to the higher coal prices and weakening ringgit as well as slow demand. Moving forward, in the medium term of 2017, the growth in public transport infrastructure, contribute to better demand for power and utilities. MIDF Amanah Investment Bank Bhd Chief Economist, Dr Kamaruddin Mohd Nor, said the country's utility giant, Tenaga Nasional Bhd (TNB), recorded solid performance in 2017, having benefitted from significant improvements in manufacturing and trade numbers.

Malaysia is well on its way to reaching the 50% Renewable Energy (RE) target by 2050, with current levels at 21.67% (7,271Mw). Energy, Green Technology and Water Minister Datuk Seri Dr Maximus Johnity Ongkili said, while current efforts include hydro power, solar energy, biomass and biogas, the Ministry was also looking into tapping wind, geothermal and wave power potential.

» The power and utilities sector is expected to see a brighter future in 2018 on the back of improved macroeconomic environment. Malaysia's oil, gas and energy industries continue to be in a strong position and are able to build a stronger foundation for the energy and economic landscape of the country despite the uncertainties in the movement of crude oil prices. Given that energy demand is expected to rise in the next five years, the government is already planning ahead with plans to commission twelve new generation projects between 2017 and 2023.

KEY ISSUES FROM THE NATIONAL MONITOR

Malaysia's consumption of coal which is about 51% of the generation mix is entirely imported. Coal fuel prices stabilised toward the middle of 2017 at around US\$80 per tonne-level after skyrocketing to above US\$100 a tonne in the second half of 2016 leading to higher electricity prices for all consumers. **Energy affordability** remain a high uncertainty issue, because of Malaysia's dependence on the foreign markets. **Exchange rates** also remain uncertain because of their dependence on imports. The cost of imported fuel is determined by the exchange rate. To remedy this situation a bit the Malaysian government is working to construct two coal-fired units with 1,000 MW capacity each, which is strategically located and is crucial to the security of power supply in Malaysia. The plant will generate additional 2,000 MW and will increase the capacity of the country to 26,940 MW by end-2020 from 22,748 MW currently. Access to electricity in Malaysia was reported at 100 % in 2014, according to the World Bank collection of development indicators. However, the Issues Map survey has identified **energy access** as a high uncertainty matter. The real challenge is sustainability; that is, ensuring the security and reliability of the energy supply and diversifying energy resources. Malaysian government understands that by diversifying the energy mix it will also increase access to affordable energy. And to achieve the mix of energy resources and technologies that will one, reduce adverse environmental effects and, secondly, maintain sustainable development at minimum cost.

Malaysia has undertaken a number of mitigation and adaptation strategies to address the **climate framework**. As per the Biennial Update Report to the UNFCCC, Malaysia has achieved about 33% reduction of carbon emission intensity per unit of GDP by considering the LULUCF approach in terms of both emissions and removals. Malaysia has voluntarily pledged to cut its emission intensity (per unit of GDP) by up to 40% by 2020 and 45% by 2030 compared to the levels in 2005. Furthermore, Malaysia is in the process of ratifying the Paris Agreement.

Major mitigation actions include implementing **renewable energy** and energy efficiency efforts, green technologies, sustainable forest management and sustainable waste management through recycling and effluent treatment. Malaysia aims to achieve its emission reduction targets through a mix of mitigation actions, the removal of carbon emissions by forestry and implementation of various national policies including the National Policy on Climate Change and National Green Technology Policy.

Power generation in the country is mainly dominated by gas and coal, accounting for 78% of the country's energy mix, and in the last five years, renewable energy (RE) has emerged, adding 22% to

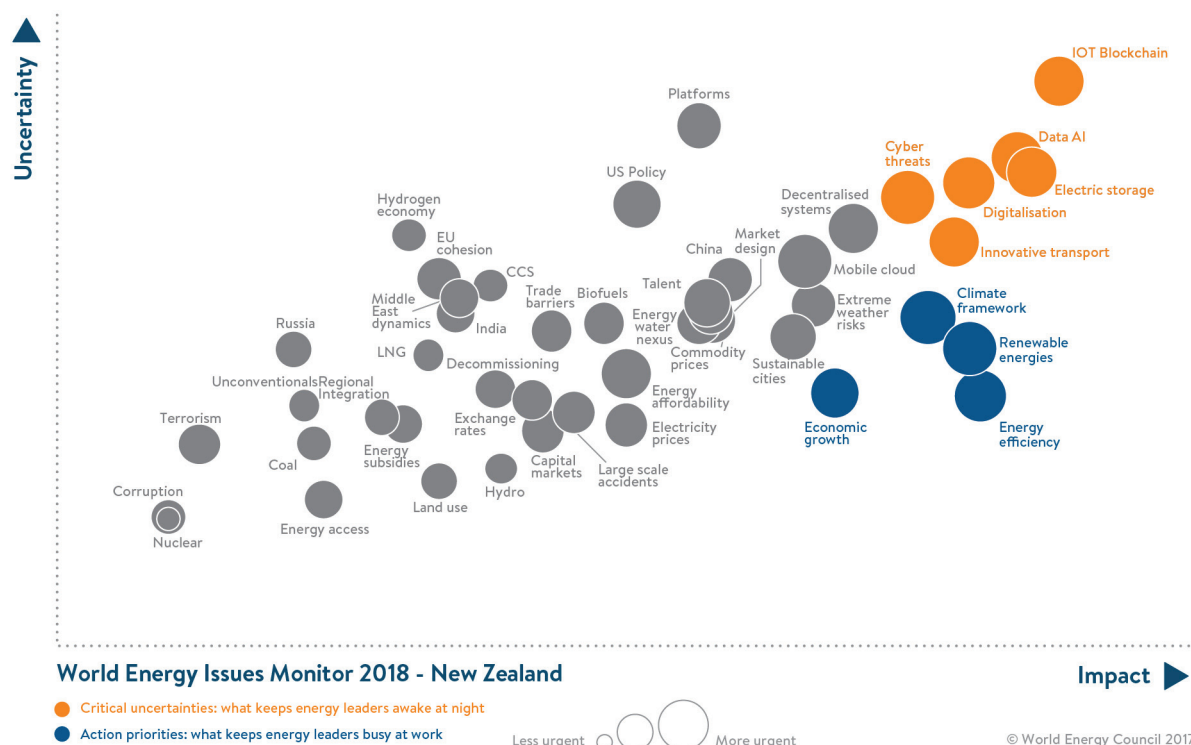
the country's energy mix. Malaysia is looking to rely on more sustainable sources of energy as the cost of fossil fuels increases every year.

Bank Negara Malaysia has raised its forecast for Malaysia's **economic growth** in 2018 to 5.5-6.0% from 5.0-5.5% previously. In its 2017 Annual Report, the Central Bank said the optimistic outlook was due to continued expansion in domestic demand and key economic sectors as well as strengthening exports that pushed the current account surplus is sustained. The Central Bank also domestic demand will continue to drive growth, as well as new and ongoing infrastructure projects and capital expenditure.

CONCLUSION

The most important aspects to focus on are the implementation of green energy technologies which includes the renewable energies and biofuels production and usage. Along with that, a strategic planning and implementation are very important to assure energy access and affordability.

NEW ZEALAND



NATIONAL OVERVIEW AND CONTEXT

Three years after the Paris Agreement, New Zealand's new centre-left government is looking to implement its pre-election commitments on climate change. The government has strongly signalled a carbon net zero economy by 2050, with work underway on how to achieve 100% renewable electricity generation in an average hydrological year, by 2035, and a ban on new permits for offshore oil and gas exploration. At the same time, a new independent Climate Commission will oversee carbon budgeting.

» New Zealand has already reached around 85% renewable electricity and 40% renewable energy. Energy executives are signalling that they are up to the task with climate framework for the first time tumbling from a critical uncertainty to an issue they are simply getting on with, alongside energy efficiency and renewable energies.

KEY ISSUES FROM THE NATIONAL MONITOR

The new energy issues map highlights a sector undergoing change at an unprecedented pace and a contest of ideas and models. The unlocking of new technologies, business models and customer engagement has begun in earnest, with falling technology costs allowing the roll-out of decentralised, personalised service offerings at scale.

This year the energy issue map highlights the strong interconnection between digitalisation, decentralisation and decarbonisation ("the 3Ds") with the first two helping achieve the third.

New Zealand energy executives are paying attention to issues around digitalisation, as new means of exchange enable new relationships with customers, who begin to see energy as a service rather than a commodity. **Digitalisation** has been the biggest mover, progressively shifting up into the top right-hand corner of the map. At the same time, energy executives are mindful of the **cyber threat** this now highlights. They also look to leverage off New Zealand's renewable electricity advantage and stretch this into **transport** fuel and industrial processes. With a sharper focus on **electricity storage** and **innovative transport**, traditional sector boundaries are increasingly being blurred.

Distributed energy resources, an issue that energy executives saw as low impact four years ago, is today becoming increasingly important to the New Zealand energy system. As New Zealand moves towards more decentralised, customer-centric solutions, technology needs to ensure sufficient co-ordination and communication, and a consistent and secure power supply. This is keeping energy executives awake at night.

The implications of the **climate framework** have become more and more mainstream. It is the 'how' that matters now to energy executives. The challenge of the 3Ds encompasses the need for access to data – i.e. some kind of co-ordinated data sharing – to enable decarbonisation through the first two of the 3Ds.

Current success by New Zealand's technology and innovation companies comes off the back of sustained past investment in education and training. This year's map highlights the new breed of energy professional required for the future and reinforces the importance for New Zealand to nurture the professionals of tomorrow. The growth of the 3Ds and the progressive uptake of low-carbon technologies will create new jobs but will also require new skill sets. An interesting feature of this year's map is the rise in uncertainty and impact on **talent** – the availability of labour with the necessary skills, qualifications and experience. Although not yet a critical uncertainty, energy leaders seem increasingly concerned about the sufficient supply of **talent** as the workforce ages, the economy continues to grow strongly, immigration levels are tightened at a time when New Zealand has the lowest unemployment rate in twenty years.

CONCLUSION

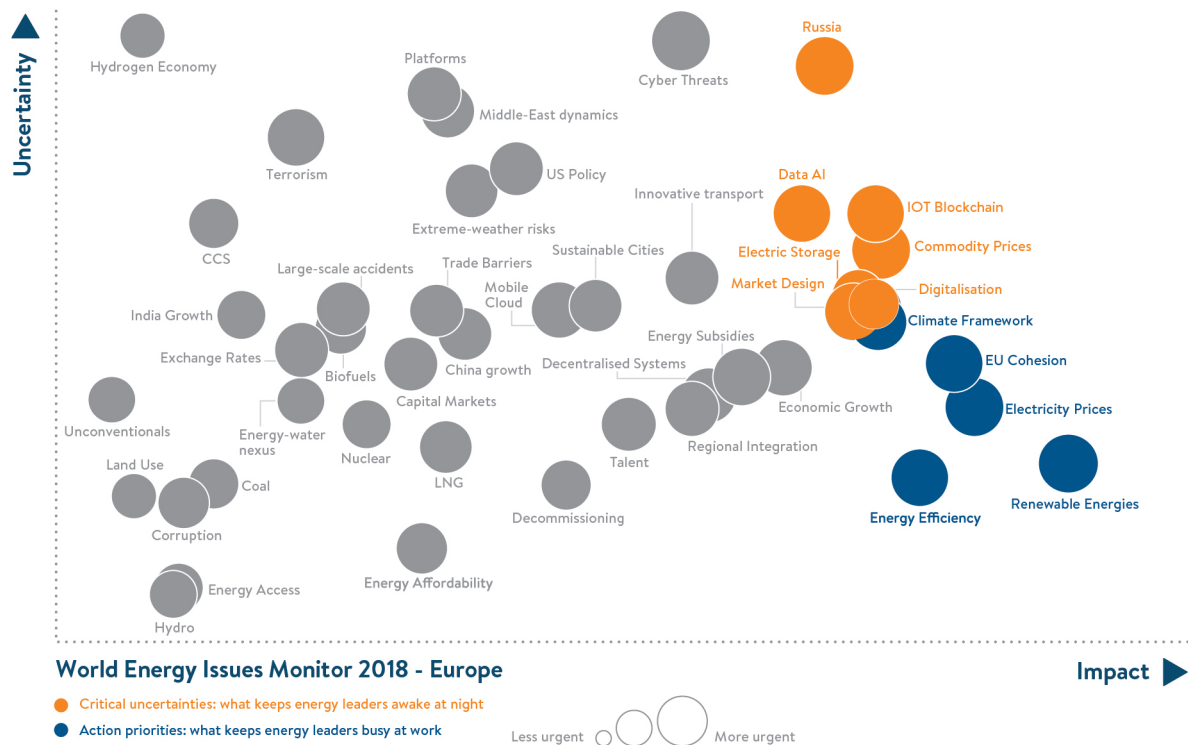
Operating in open, competitive and unsubsidised energy markets, energy executives have the mettle to test new approaches and this confidence appears to be growing with the clearer sense of direction from the government. New opportunities for energy supply and use are developing and New Zealand is well placed to leverage off its competitive advantages, driving innovation built on them. However, as New Zealand moves towards more decentralised, customer-centric solutions, to sustain momentum, New Zealand must ensure a robust, technology-neutral approach to maintaining a dynamic and resilient market framework that supports the transitioning of our energy system.

Assessing the energy agenda for Europe

EUROPE
AUSTRIA
BELGIUM
ESTONIA
FRANCE
GERMANY
ICELAND
ITALY

LATVIA
LITHUANIA
POLAND
PORTUGAL
SERBIA
SLOVENIA
SPAIN

EUROPE



The innovation cluster with all of its benefits and challenges is strongly driving the energy agenda in Europe. First, one can continue to observe a strong trend in Europe towards decentralised power generation supported by more active customers, competitive economics, and political support. It is therefore not completely surprising that second, for the critical uncertainties the newly introduced issues “**Internet of things / Blockchain**” and “**Data/Artificial intelligence**” have entered straight to the top of the agenda. Both these trends lead to further consequences, as an increasing awareness on cyber security, more interest in electric storage and the need for a new market design.

These new topics result in a stronger need for the distribution grid operator to have access to all data to keep his grid stable. Furthermore, blockchains may also offer opportunities and threats in the micro-trading area. Yet, the legal concept of a blockchain within the EU is not an easy issue to solve.

An important shift has happened in the topic ‘**climate change**’: once the highest uncertainty it has now become an action priority in Europe. Along with important policy decisions as Paris agreement and EU updates on regulations on the EU emissions trading scheme, the energy sector has now got a more precise view of the future. Together with renewables and energy efficiency all three pillars of the EU energy and climate policy (“winter package”) are in the action priority segment.

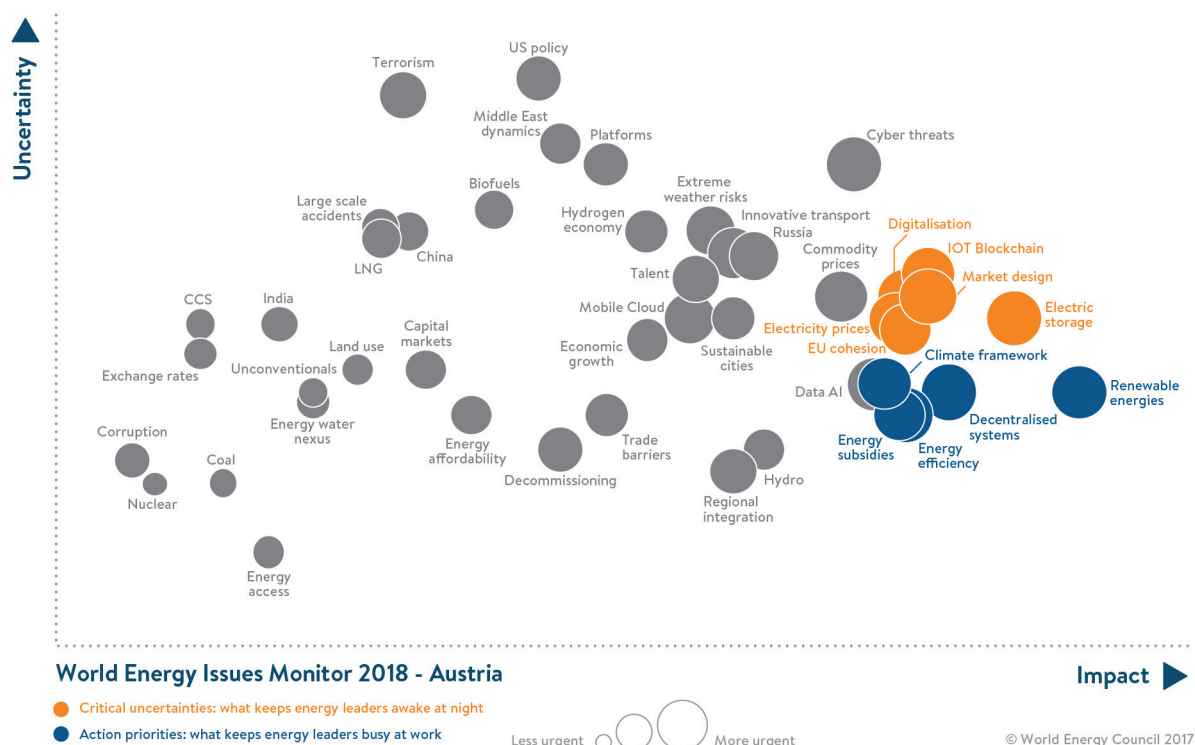
Within Europe we also see that central solutions (coal, CCS, unconventional) continue to lose ground in their relative importance against decentralised renewable solutions. This does not mean that centralised solutions will no longer play a role – they are in the next decades certainly needed to secure the supply. But it shows that the focus is certainly stronger on the new innovative technologies. The new energy world is characterised by an extremely high number of assets

(decentralised generation, storage, demand response) and actors (prosumers). To keep this system up and running, an enormous exchange of data is needed – hence digitalisation is a necessity to allow for more flexible solutions. There are also challenges as cyber threats associated with it: driven by some smaller incidents in other industries, the energy sector is now also realising that the digital environment is more vulnerable to attacks from hackers.

One of the core technologies will be **storage** – especially, since this is also an important technology cluster in order to electrify transport and heating. For transport electrical storage is decisive and especially the expected large scale roll-out of electric vehicles might lead to new disruptions in this field.

Another consequence of the changes in the energy system is the question for the right market design: the existing electricity market design was driven by central and dispatchable power stations – the future energy world has different characteristics with a strong weather-driven production at zero marginal costs. Hence a new market design is also needed – and consequently Europe sees this now as an action priority.

AUSTRIA



NATIONAL OVERVIEW AND CONTEXT

The energy mix in Austria is dominated by fossil fuels accounting for 66% of total supply. Oil is the largest source of energy at 36% of TPES, followed by natural gas at 21% and coal at 9%. Renewable energy and waste account for 32% of total supply. Around 40% of Austria's energy needs are produced locally and the country relies on energy imports to satisfy its energy demand.

» Austria is already close to achieving its 2020 renewable energy target of 34% (in 2016, 33.5% of its final energy consumption came from renewables). Austria is at risk of missing its 2020 target for energy efficiency. The GHG-emission target will be missed without further efforts.

KEY ISSUES FROM THE NATIONAL MONITOR

Market design is a critical uncertainty for Austria, because of the ongoing decoupling of the power lines between Austria and Germany. The two countries have had a common bidding zone since 2001. The EU regulatory authority ACER decreed in November 2016 that the integrated electricity market comprising Austria, Germany and Luxembourg must be split. The power lines between Austria and Germany cannot handle the volume of electricity being traded across the border, ACER said.

After Austria had unsuccessfully contested this opinion at the European courts, the regulatory authorities for energy of Germany and Austria came to an agreement in May 2017, and the common price zone will be split up in October 2018. In the electricity market, the German-Austrian power

price zone split was the dominant theme of the past year and poses a critical uncertainty for the near future, explaining the critical uncertainty of **electricity prices**. There is certainty over some free cross-border electricity trade, with 4,900 MW long-term cross-border capacity available without prior capacity booking.

Austria is actively progressing with implementing policies and targets associated with the climate framework, energy efficiency, and renewable energies, which is illustrated by the ongoing clustering around these issues in the Monitor map. Energy policy developments in Austria and targets for 2020 are compatible and in line with EU policy, including: an increase of the share of energy consumption produced from renewable resources to 34% by 2020; reducing greenhouse gas emissions by 16% from 2005 levels for sectors not included in the EU Emissions Trading Scheme (EU ETS) and 21% from 2005 levels for sectors included in EU-ETS; and a 20% improvement in energy efficiency by 2020.

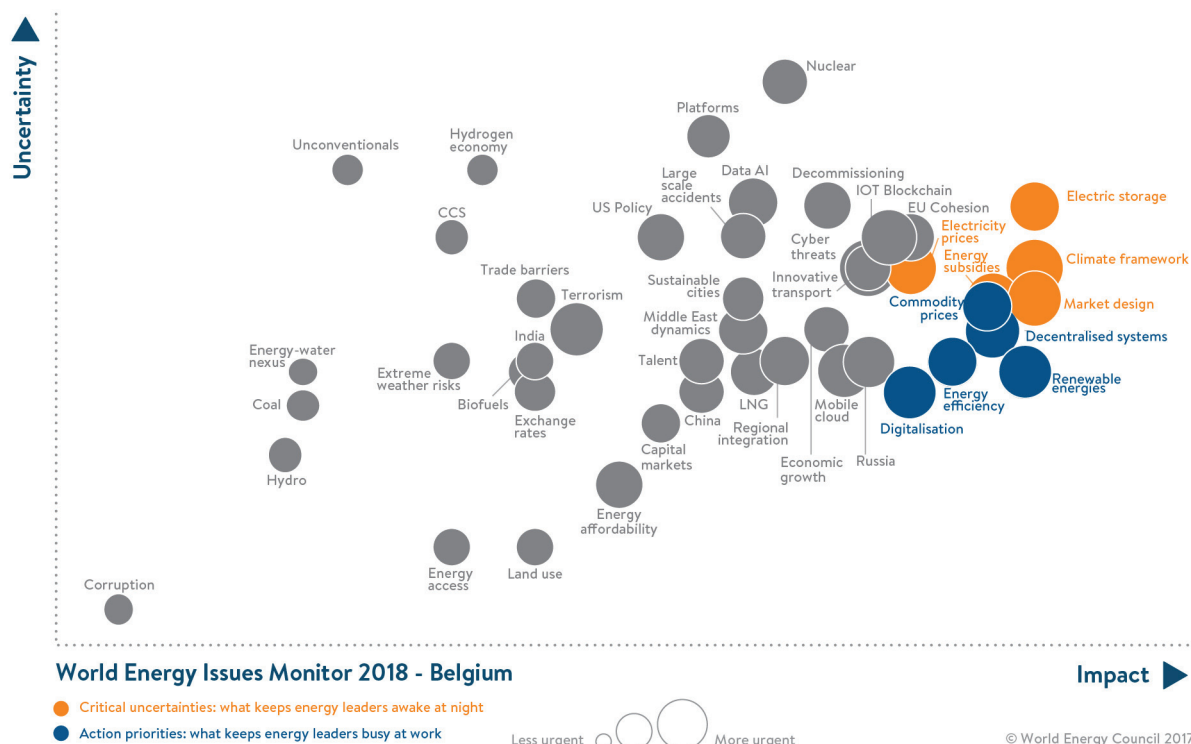
Renewable energy is an action priority in the Issue Monitor, because the Austrian government is working on amendments and a new energy strategy that may include a carbon budget, higher renewable energy targets and national benchmarks.

In February 2017, the European Commission requested that Austria correctly implement and apply the Electricity Directive (Directive 2009/72/EC) and the Gas Directive (Directive 2009/73/EC). The Directives are part of the Third Energy Package and contain key provisions for a proper functioning of energy markets, including rules on unbundling of transmission system operators from energy suppliers and producers. Austria has incorrectly transposed several unbundling requirements concerning the independent transmission operator unbundling model and has not fully respected rules concerning the powers of the national regulatory authority. The revised implementation of these policies is another impactful activity pursued by energy leaders in Austria.

CONCLUSION

The Austrian government unveiled its new energy and climate strategy on April 3rd, 2018. The paper called “#mission2030” is to help Austria reach the EU climate goals. The Austrian government is aiming for all electricity to come from renewable sources by 2030 (the current figure is 73%) and for a fully decarbonised energy sector by 2050. Overall, the Austrian Issues Monitor is influenced by the debate on an integrated energy and climate strategy and the discussion on the separation of the German-Austrian electricity market.

BELGIUM



NATIONAL OVERVIEW AND CONTEXT

In 2017, the federal and regional energy ministers discussed the drafting of the ‘Energy Pact’. An in-principle agreement on a common ‘vision’ was reached in December 2017, but the definitive confirmation had to await federal approval on March 30th, 2018.

» The ‘Energy Strategy’, as it is now called, outlines the country’s energy and climate policy until 2050, including the ‘in principle’ shutting down of the nuclear plants by 2025, as foreseen by the law. The closing down of all plants by that date will depend on reaching the set conditions of security of supply, ‘acceptable’ electricity prices (compared to the neighbours), fulfilling the climate-change commitments of Paris COP 21, and the safe operation of the (nuclear facilities).

KEY ISSUES FROM THE NATIONAL MONITOR

The shutting down of the nuclear power plants was heavily discussed during the year, explaining the very high uncertainty for **nuclear energy** in the Issues Map. As Belgium has already chosen to move away from coal, the Energy Strategy’s objective is for an energy mix based on gas and **renewable energy** along with a gradual reduction of global consumption of fossil fuel. Adding to the uncertainty are current discussions on capacity remuneration for gas-fired plants which are not expected to be finished before May 31, 2018.

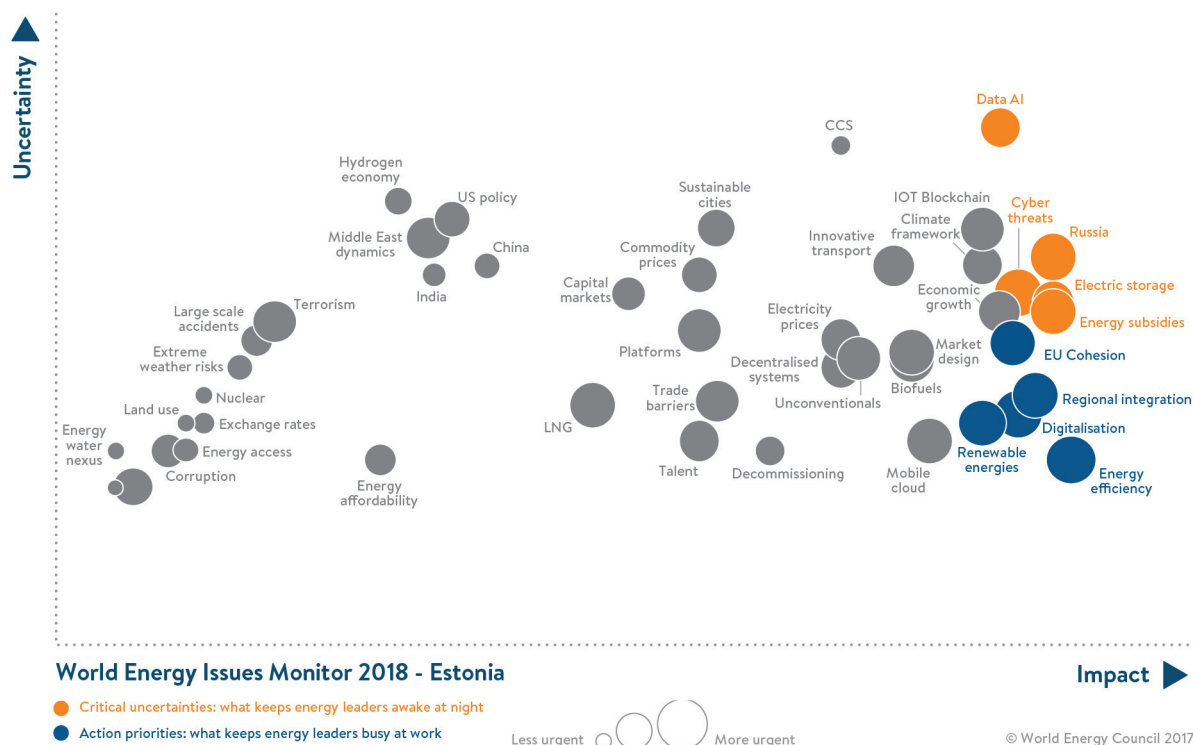
Other aspects of the energy pact/strategy include increasing **energy efficiency** and reducing consumption based on a series of measures such as: strengthening energy standards applicable to all types of consumer goods; speeding up the renovation of residential, tertiary and public buildings; and banning sales of oil furnaces from 2035. The aim is to raise the energy performance of residential buildings. Public buildings and offices, for their part, will be required to become energy neutral by 2040 and 2050 respectively. Consequently, **electricity prices**, especially those for large industrial consumers, are still a concern for the industrial consumers. Large consumers call for the application of an ‘energy norm’ so that energy prices in Belgium, and in particular for electricity and natural gas, would no longer be superior to those in the neighbouring countries. The other key critical uncertainties are **electric storage**, the **climate framework**, the future **market design** and the role of **energy subsidies**. **EU cohesion** is still high up on the critical uncertainty agenda, fueled by the Brexit and its possible impact on the Belgian economy.

The action priorities are dominated by **renewables** and **decentralised systems**, with **digitalisation** becoming ever more important. These are priority issues because that is what reality dictates. Indeed, Belgium is transitioning away from nuclear and coal and more toward a decentralised system with an electric energy mix that prioritises renewable energies and natural gas.

CONCLUSION

The Belgian issues map is similar to the other issues in Europe, except that the nuclear phase out issue still creates major uncertainties. Unlike other European countries, Belgium is not too concerned about the impact of Russia on gas delivery, since its natural gas-contract import portfolio is very diverse, with 20 entry gas points.

ESTONIA



NATIONAL OVERVIEW AND CONTEXT

The year in energy can be described as stable, no major new investments or regulatory changes. This has given people a chance to focus on longer term issues, such as the potential impacts of digitalisation and the rise of AI. This, of course, does not mean that people would not be dealing with the important day-to-day issues like energy efficiency or renewables.

The current state of energy policy is clearly visible from the Estonian Issue Map, where energy efficiency, renewables, and digitalisation stand out as the main action priorities, complemented by regional integration and EU cohesion. The prominence of energy efficiency is explained by the simple fact that people and businesses in Estonia understand that energy not spent is the cheapest energy. Energy saving measures are also supported by the Estonian government, giving an extra incentive to invest in efficiency improvements.

» In October 2017, the Government confirmed the Estonian Energy Development Plan until 2030 (ENMAK), the main objective of which is to ensure the availability of energy supplies to consumers at the best possible price. A few of the major objectives of the approved plan are a working, independent, subsidy-free and open fuel and electricity market and renewable energy generation works without subsidies and achieves 50% of final consumption of domestic electricity.

KEY ISSUES FROM THE NATIONAL MONITOR

In Estonia, there has been a long period of uncertainty regarding subsidies for renewables. At the time the survey was conducted, the new support scheme for renewables wasn't yet approved by the European Commission. Now, this is done and once it is legislated, the level of uncertainty should drop significantly.

Critical uncertainties are without question topped by **data and AI**. This might be because it was the first year this issue was introduced. Another reason might be that a lot of people are talking about AI, but not many understand what the impact might be. The uncertainty associated with **energy storage** is most probably tied to the growing share of renewables and electric vehicles. Renewables need storage to stabilise its intermittent nature. Add to this all the potential new business models that storage might enable, and the importance becomes easy to understand.

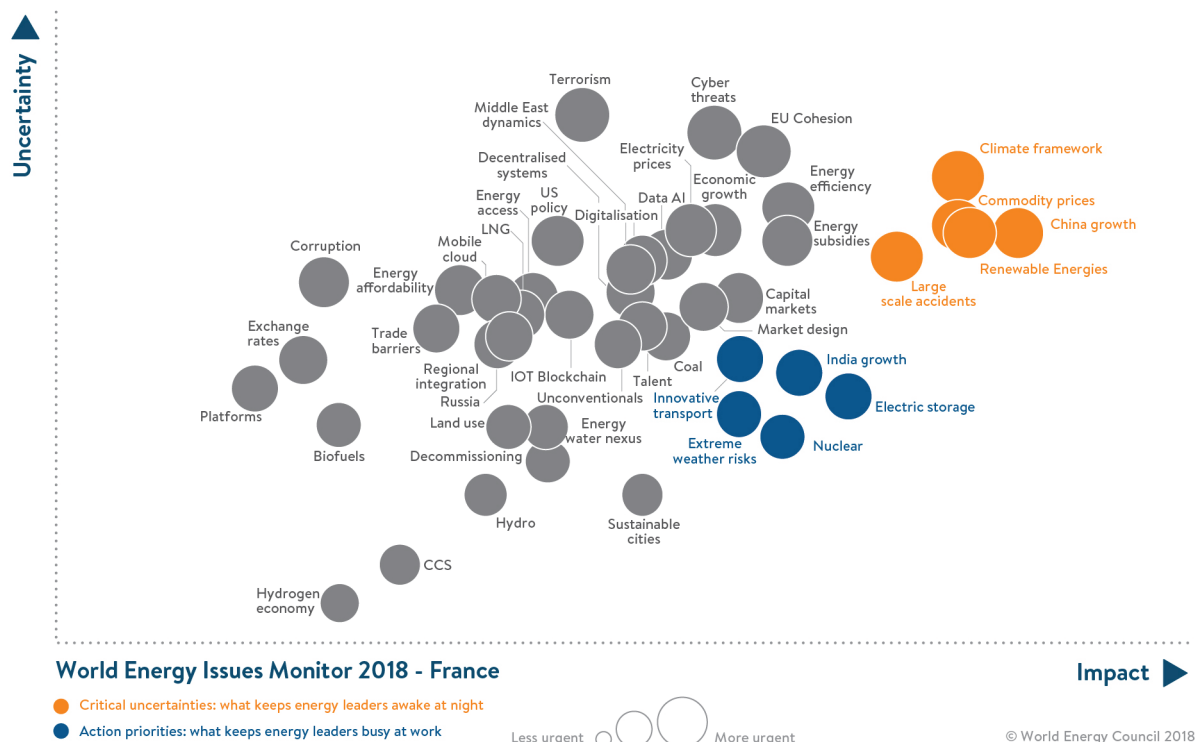
On the Estonian Issue Map energy efficiency, renewables, and digitalisation stand out as the main action priorities, complemented by regional integration and EU cohesion. The importance of renewables on the Estonian map is a sign of the changed landscape in energy, everybody in Estonia agrees that **renewables** are here to stay, the only question left to answer is how fast should the pace of change be. **Digitalisation** and regional integration as action priorities are explained by the fact that Estonians understand the value of both. The value of digitalisation is easily demonstrated by the simple fact that thanks to the roll-out of digital meters the distribution grid losses in Estonia were reduced from 5.7% in 2014 to less than 4.1% in 2017. The value of regional integration has been understood by the cost savings realised by being part of the NordPool market.

The three prominent issues: renewables, digitalisation, and regional integration are all part of another issue – market design. **Market design** needs to be solved to avoid problems in other aspects of the energy scene.

CONCLUSION

This was the first year the Estonian map was topped by data AI, most probably this will remain the case for the coming years. Digitalisation is the future of energy and Estonians are willing to embrace this change.

FRANCE



NATIONAL OVERVIEW AND CONTEXT

The French energy policy is strongly influenced by the Law on Energy Transition for Green Growth published in 2015 which aims to enable France to contribute more effectively to the fight against climate change and to the preservation of the environment, as well as to reinforce its energy independence while offering its companies and citizens access to energy at a competitive cost.

» With the new government now firmly in place, and the overwhelming support of the French people supporting the energy transition, France is poised to take a leading role in driving forward the EU's climate diplomacy. However, in late 2017, France announced that the government target of increasing renewable energy in the electricity mix would be postponed. France relies heavily on nuclear energy. As part of the 2015 Act the French government encourages to invest heavily in renewable energies and energy efficiency. However, decreasing reliance on nuclear, which is over 70%, to 50% is proving difficult.

KEY ISSUES FROM THE NATIONAL MONITOR

Climate framework is highlighted, not only by its importance but also by the uncertainties about the framework for action. Among the important and uncertain issues are the development of **renewable energies** and the question of **electricity prices**, but also the importance of **China growth**, whose choices on the supply side (PV panels) and the demand side (electric vehicles) are decisive. Among the somewhat less important issues are energy efficiency and the issue of subsidies. The important but less uncertain issues are, not surprisingly, nuclear and electricity storage, which tends to be

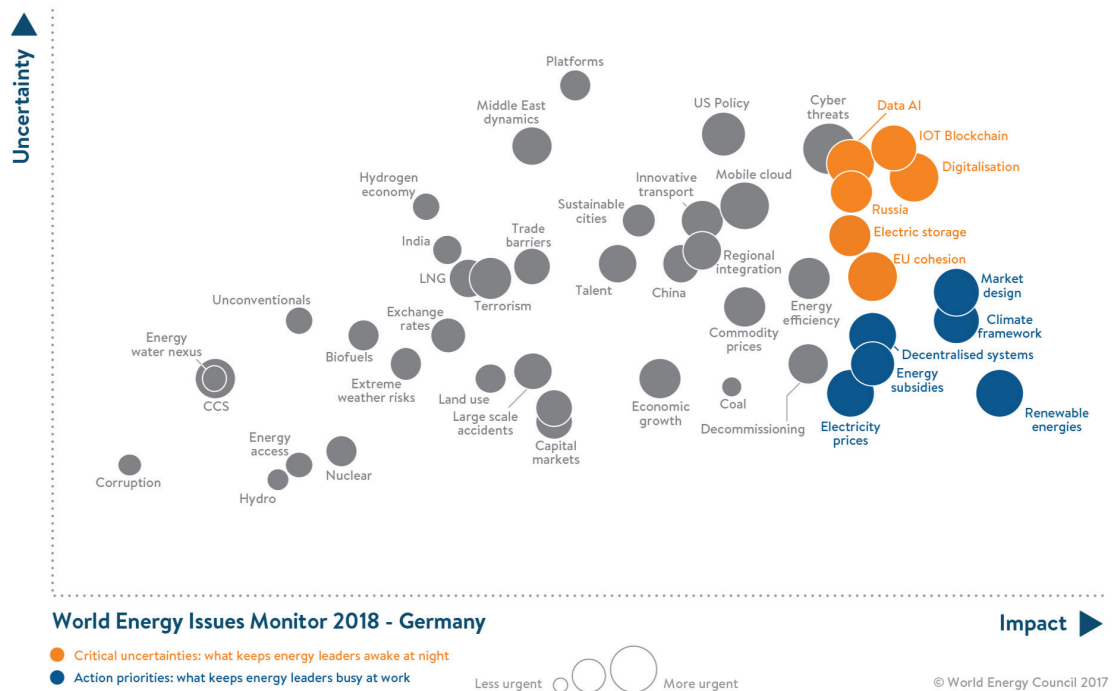
considered a major issue. On the other hand, among the low stakes are hydrogen, carbon capture and storage and biofuels. The digital issues are all grouped at the map centre, therefore of average importance and uncertainty, with the exception of platforms characterised by low importance.

India's growth is a priority and France and India have signed a series of agreements to strengthen their strategic and commercial relations. Climate change is the goal of several projects: nuclear energy, renewables and sustainable urban development. Another action priority to keep an eye on is **electric storage**. France has set the ambitious target of reaching 40% of renewable electricity by 2030 and is presently initiating the transitioning of its electric system by making it more flexible through energy storage.

CONCLUSION

France is poised to head the clean energy revolution, especially as the United States under President Donald Trump pulled out of the Paris Agreement on climate change. France continues to integrate measures to tackle climate change into regular economic policy which should have a positive impact on economic growth in the medium and long term.

GERMANY



NATIONAL OVERVIEW AND CONTEXT

Germany's electricity market is still undergoing the transformation process of the "Energiewende". With a 36% share of the power market, renewables have reached a new record in 2017 and the outlooks show a continuing growth. The change towards a bidding process for renewable power production has reduced the costs for new installations, but overall electricity prices have slightly increased. As a side effect, the volatility of the electricity wholesale prices has increased significantly and also reached a new peak, whereas Germany in total has seen 146 hours in 2017 with a negative electricity price. The challenge of balancing the grid while improving the integration of renewables and, therefore, intermittency is on the working agenda of the sector.

Due to the high proportion of renewables in the energy mix and the ongoing process of phasing out nuclear by 2022, coal power still contributes a significant share of the electricity supply in Germany. The share of natural gas has increased over the last three years.

» Germany's power sector is reducing emissions steadily, however, other sectors have seen little progress and have started to shift their emissions into the power sector. Specifically, the system of ETS (Emissions Trading Systems) and Non-ETS measures is not yet well balanced and causes issues in respect to future developments such as sector coupling. Total CO₂ emissions remained more or less stable in 2017 despite the reductions which were achieved in the power market.

KEY ISSUES FROM THE NATIONAL MONITOR

The German issues monitor map acknowledges several uncertainties and priorities, which are also reflected by the global and European level maps. They can be attributed to three main clusters: innovation, energy technologies and political framework.

Innovation is the most critical uncertainty, with **IOT Blockchain, artificial intelligence** and **digitalisation** being on top of the agenda of German energy leaders. Setting the scene for a high share of renewables in the power sector still requires significant base load capacity and having a sufficient grid to connect a renewable-rich north with the large energy needs in the south. Innovations such as the digitalisation as a broader concept and blockchain as an IT technology are expected to have an impact on this discrepancy of supply.

The first wave of **digitalisation** in the form of smart meters was not a success story for households in Germany. However, with decreasing costs for energy storage, especially batteries, and the improved interconnection between demand and supply in the electricity grid, digitalisation can pave the way towards a well-balanced electricity network with millions of prosumers, who produce, consume and also store electricity. The first pilot projects are currently under way and try to showcase the practicability.

Germany is not only undergoing a national energy transition, it has also committed to the European energy transition and the Paris climate agreement, a complex system of European and national regulation is in place. The German Energiewende has increased the share of renewables in the power sector up to 36%, but it has also grown a fragmented and inefficient regulatory framework. Concerns about **market design** including comparable high energy prices and energy subsidies for renewable energies as well as the **climate framework** are the action priorities of German energy leaders. The group of leaders is, therefore, more heterogeneous than ever before. While the rise of renewables is taking place, decentralised systems have grown. The ownership of power plants has dramatically shifted from conventional power plant owners towards small scale renewables such as PV and wind owned by communities and individuals. Nevertheless, the German “Energiewende” with high subsidies and high consumer end prices still has strong support within in the whole society, which is willing to pay add-on fees for **renewable energies**.

Additionally, Germany and Europe are facing the challenges of security of supply and energy independence. The country is importing approximately 70% of its energy resources every year. The geopolitical relation between the EU, Russia and the US interfere with a European energy strategy. For example, projects like the North Stream 2 pipeline are no longer discussed from an economic viewpoint - the geopolitical dissonances from global conflicts affect the development of such projects.

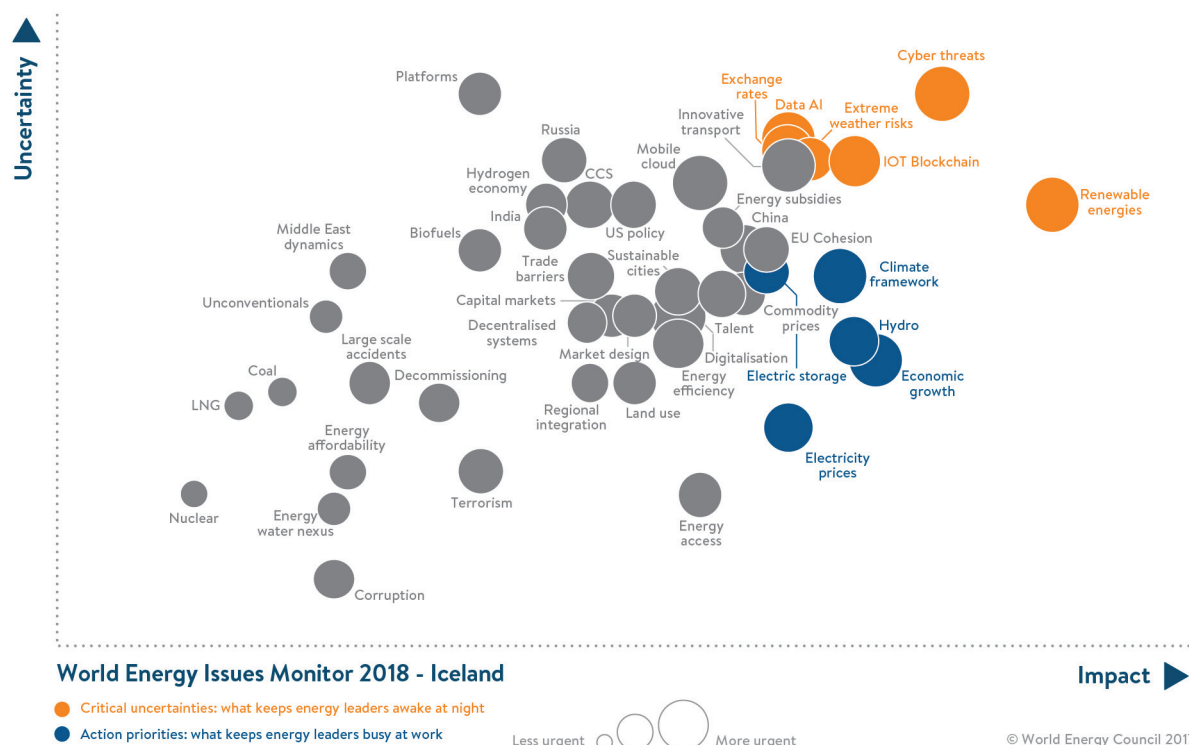
CONCLUSION

Germany transition of the power sector is a continuing process, market incumbents are challenged by new non-power-sector competitors and a change of prosumer behaviour. Ongoing digitalisation

has the potential to solve the technical challenges of the increasing level of renewables. Other technologies like energy storage are required to enable these developments. Until these solutions are realised, fossil-based energy resources will continue to play a significant role.

Political challenges arise not only on a national level, where strong social support backs the energy transition, but also on the European electricity market where there is still discussion of overall commitments, and challenges like the security of supply and energy independence.

ICELAND



NATIONAL OVERVIEW AND CONTEXT

Economic growth in Iceland is strong with continued expansion in tourism, robust private consumption and favourable terms of trade. Steep wage gains, employment expansion and large investments are fuelling domestic demand. The capital controls introduced during the financial crisis have mostly been lifted.

» Households and businesses can benefit from energy prices that are among the lowest in Europe due to the renewable nature of power generation and economics of scale in volumes for large industries, which is capital intensive but involves no fuel costs.

KEY ISSUES FROM THE NATIONAL MONITOR

The greatest change and movements of individual parameters in the survey in Iceland from 2016 to 2017 are associated with **cyber threats**, **renewable energy** and **electric storage**. Along with **data AI**, the uncertainties around these issues most likely reflect a similar perception in the global scenario. Concerns around the **exchange rate** are still relevant and relate to the volatility of the Icelandic krona, which has appreciated about 30% from 2015 – 2017. In the energy sector, this is mostly significant in the area of export of consulting services and energy products which are usually traded in foreign currencies, while the operational costs are exchanged in local currency. In addition, the capital intensity of the energy industry the prevalence of loans in foreign currencies are expected to affect the overall operational and financial risk and cost of investors.

Interestingly, both around uncertainty and impact the exchange rate and financial markets issues in Iceland are ranked markedly higher than in Europe and the rest of the developed world, while showing most similarities with the less developed regions of Africa. On the other hand, the Icelandic electricity market has been very competitive in OECD prices comparison, due to natural energy resources and large-scale power production for large industrial customers, such as aluminium and ferrosilicon factories as well as data centres. These customers have created economies of scale in power demand and production, which have resulted in globally competitive prices, even though Iceland's geography prevents interconnection with other countries.

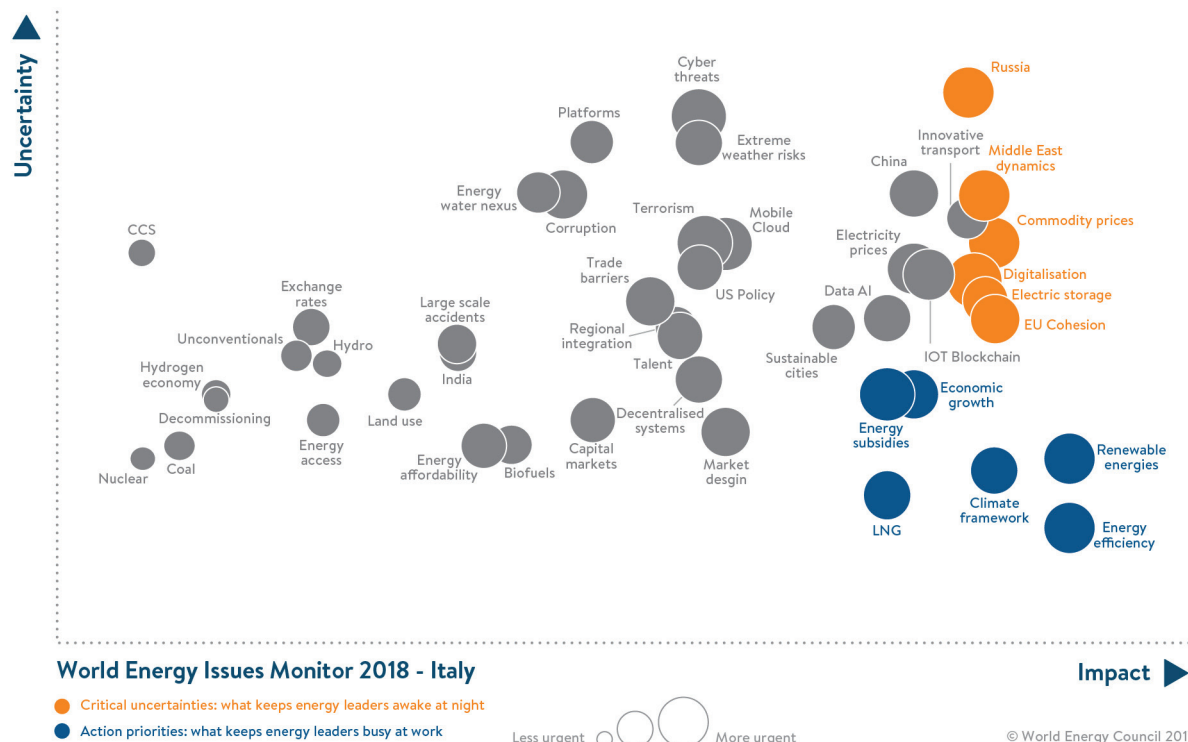
The most important needs for action revolve around **climate framework**. After the Paris COP21 agreement, most energy leaders acknowledge that renewables and decentralised systems will play a major role towards mitigating climate change. The action priorities on issues such as **hydro, electric storage** and **electricity prices** suggest a continuity in the country's generation strategy and an alignment with the goal of greater security and efficiency of the national energy system.

The significant change towards greater uncertainty of **renewable energies** is surprising, and is a reflection of stronger national debate on new hydro and geothermal projects, where the focus prevails around nature conservation rather than national economic and social challenges. In addition, the renewables role in mitigating climate change is perhaps not often recognised in the national debate.

CONCLUSION

The climate issue continues driving efforts in Iceland as the country is challenged with lowering emissions. Developments around electric storage and great competitiveness of the power market drive action while strong similarities with issues faced by developing economies of Africa, especially around capital markets, illustrate the issues that keep Iceland's leaders busy at work and awake at night.

ITALY



NATIONAL OVERVIEW AND CONTEXT

In an international context characterised by a rising global economic activity, in 2017 Italy continued to improve its environmental sustainability, reducing greenhouse gas emissions and pushing on energy efficiency and security of energy systems: renewable sources covered about 17% of gross final consumption of energy; the energy intensity of GDP fell by 4.3% compared to previous years; a 7% reduction in energy imports compared to 2010 was registered.

» The 2017 National Energy Strategy, the most relevant recent issue in the Italian energy, was adopted by the Ministry of Economic Development and the Ministry of the Environment and of the Protection of the Territory and of the Sea. It sets 10-year targets for specific energy sectors/areas. The strategy fixed three pillars for the Italian energy sector: i) Competitiveness: Reduce the price of energy by through alignment with EU policies to ensure the competitiveness of the national market; ii) Security: Improve security and flexibility of the energy system with special focus on sustainability, and iii) Environment: Overcoming 2030 European environmental targets, in line with the COP21 and Road Map 2050 objectives through the decarbonisation of the energy system and the phasing out of coal starting from 2025.

KEY ISSUES FROM THE NATIONAL MONITOR

The Italian government is tackling the emergence of **digitalisation** in the global energy landscape through policies included in the National Industry 4.0 Plan. These policies offer multiple support tools to manage and help exploit the potential of digitalisation within the industry.

In response to issue of **cyber threats**, the government has recently approved a decree for the implementation of the Network and Information Security (2016/1148) Directive, with the objective to i) promote the culture of risk management and incident reporting among main actors that own and operate critical infrastructures (including energy companies); ii) improve national cyber security capabilities; and iii) strengthen cooperation at national and EU level.

Energy efficiency and **renewable energies** remain action priorities among efforts to promote these two areas from European and national leaders. For instance, the National Energy Strategy sets targets for both energy efficiency (-10 Mtep on final consumption) and renewable energies (28% of the total national consumption) to be achieved by 2030.

Italian authorities and energy operators are working together to develop small-scale **LNG** infrastructure, seen both as a means to improve the security and the deployment of natural gas supplies, and enabling sustainable transportation (LNG as a fuel for ships and trucks). An important development in this sector has been the enactment of the decree on the “promotion of the use of bio-methane and other advanced biofuels in the transport sector”. The decree establishes an incentive scheme for bio-methane and will contribute to achieving the EU biofuels target adopted by Italy.

Even if **electric storage** is approaching Action Priority area, the issue continues to be perceived as uncertain mostly due to the evolving regulatory and technological framework. Electric storage is mostly connected to the development of renewable energies and electric mobility, two areas of great interest for national and local energy stakeholders.

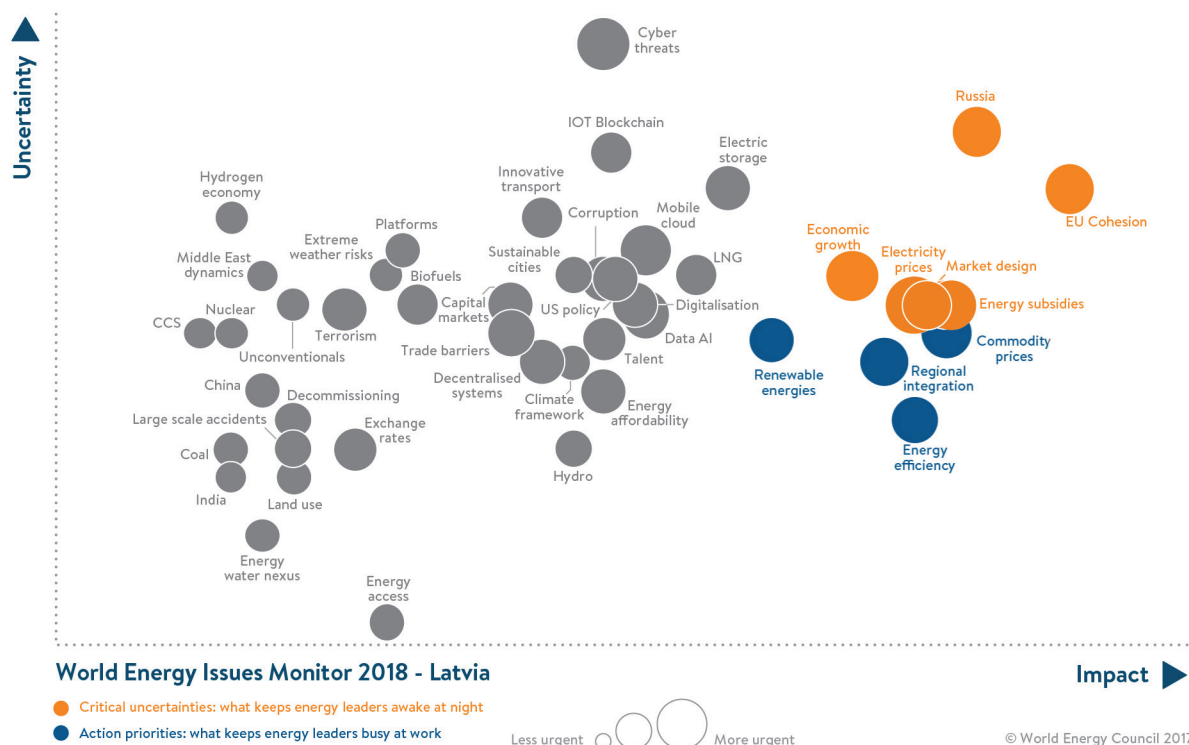
The highest consensus over the last years has been registered around innovative transport and LNG, themes that are partially interlinked, especially for what concerns the use of LNG and bio-LNG as fuel for ships and trucks. As for innovative transport, local authorities and transport companies from large Italian cities are working on the development of shared mobility, electric mobility and other solutions. At the national level, important partnerships have been signed between energy companies, the natural gas grid operator, fuel distribution network owners and car/truck producers for the deployment of natural gas and electric mobility.

CONCLUSION

In the context of an ongoing energy transition, Italy is looking to expand the role of renewable energy and natural gas as it works to reduce carbon footprint, improve environmental sustainability and continue to reduce and diversify imports dependence.

With reference to the transport sector, Italy is moving towards a more diversified portfolio of technologies and solutions for sustainable mobility and transports which are complementing the evolution of traditional fuels and engines. These trends are contributing to reduce the environmental footprint of the Italian transport sector.

LATVIA



NATIONAL OVERVIEW AND CONTEXT

In 2017 Latvia was third in renewable energy generation in Europe behind Sweden and Finland. The most common renewable energy sources in Latvia are biomass and hydro-power, where also significant R&D capacity has been developed, to maintain a sustainable growth of domestic industries and assist our partners abroad. Opportunities to develop wind power and solar energy segments are still open. Energy Efficiency is also an ongoing effort in the country. Latvia is starting with its capital city of Riga by creating a revolving fund linked to a soft loan scheme. This will provide loans at a low interest rate (up to 3% APR) to citizens and non-profit organisations. The goal is to increase energy efficiency and the use of renewable energy and to reduce energy consumption in the housing sector.

» In early 2017, Latvia opened its gas market to competition: instead of one single supplier, consumers will be able to choose between several possible suppliers. This is part of a wider effort to develop a diversified and secure gas market integrated with the gas infrastructure and markets of other EU countries, and with reduced dependence on energy sources from Russia.

KEY ISSUES FROM THE NATIONAL MONITOR

Latvia is strongly influenced by geopolitical uncertainties, such as **EU cohesion** and **Russia**. Through its membership of the European Union and NATO, Latvia is an independent country with ties to the West. In the economic sphere, the country still remains under significant Russian influence, which

includes restrictions on Latvian natural gas imports. At the same time, the Latvian Energy Long Term Strategy 2030 sets a target of 50% share of renewable energy in the mix and a reduction of 50% of energy imports. Aside from EU Cohesion and Russia, several debates and contention persist on the level of **electricity subsidies** offered to the industry.

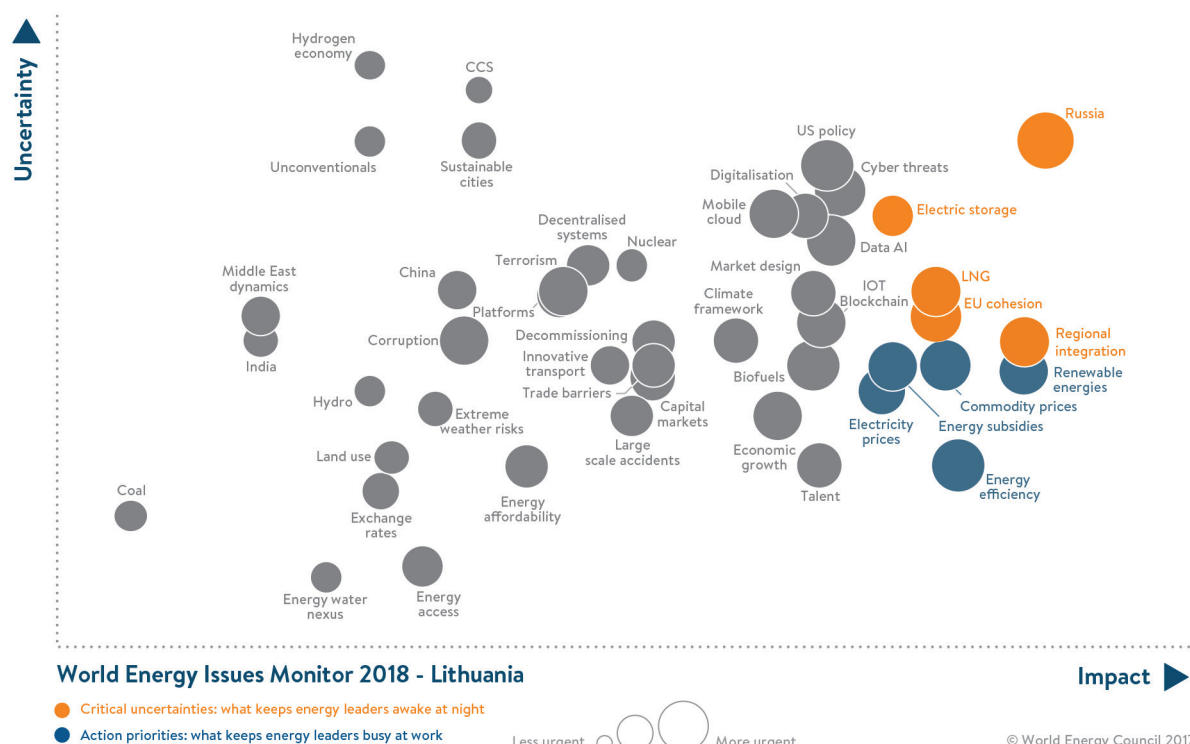
The **energy efficiency** law, which came into force in 2016, contributed to a decrease of uncertainty, but there are still some unresolved issues like obligation schemes and alternative measuring system.

In 2016 the Baltic Prime Ministers signed a declaration on Regional Gas Market Development by 2020 and the Latvian natural gas market was opened for free trade in 2017. In addition, new legislation on transmission and storage infrastructure has been created. These actions contribute to the diversification of gas supply and enhanced energy security.

CONCLUSION

This year's Issues Monitor findings show that Russia remains a significant player in Latvian energy sector development. A progress in the implementation of planned grid interconnection from Latvia to Estonia, to be completed by 2020 as a part of BEMIP, is further expected to improve energy security and equity in the country. A diversification of gas imports, favoured by a new LNG terminal in Lithuania and ongoing BEMIP-G projects, is likely to further contribute.

LITHUANIA



NATIONAL OVERVIEW AND CONTEXT

Lithuania is continuing efforts to reduce its dependence on Russian energy sources. The main goal is to eventually achieve energy security and independence. Currently, the country is a net importer of electricity and natural gas. By 2050 Lithuania expects all consumed electricity to be generated in the country. It is expected that by 2020 Lithuania will produce 35% of its electricity demand.

» The key issue for Lithuania is the synchronisation of its energy systems with that of continental Europe. The goal is to fully harmonise systems for EU cohesion by 2025: this is a key priority for Lithuania, which is reflected on this year's Issues Monitor map. More specifically, the goal is to move away from total dependence on the Russian electricity system and to bring Lithuania into line with the networks of continental Europe.

KEY ISSUES FROM THE NATIONAL MONITOR

Many of the critical uncertainties in Lithuania's Issues Monitor map stem from the most important issue of **Russia**: independence from Russian supply is the main issue keeping Lithuanian energy leaders awake at night, and most of the sector's priority efforts are directed towards this goal.

Diversification of supply away from Russia makes **LNG** an associated critical uncertainty. Rising maintenance costs at Lithuania's LNG terminal in Klaipėda is requiring urgent solutions, as this critical element of energy infrastructure allows the country to import gas from suppliers other than Russia. As an energy importer, Lithuania is vulnerable to volatility in **commodity prices**, which means this issue is never far from energy leaders' minds.

As Lithuania works towards the synchronisation of its networks with continental Europe, further **regional integration** of energy networks is expected between the Baltic countries.

The uncertain future of **electric storage** represented on the map reflects the fact that the market is not yet offering matured technologies for this to progress. Storage could help Lithuania achieve its energy security and integrate larger amounts of **renewable** generation in the future.

Similar to many European countries, and driven by wider **EU policy**, Lithuania's priorities for action cluster together issues around **energy efficiency** and **renewable energies**. Lithuania is working on driving efficiency through the renovation of internal heat distribution systems in multiple occupancy residential buildings.

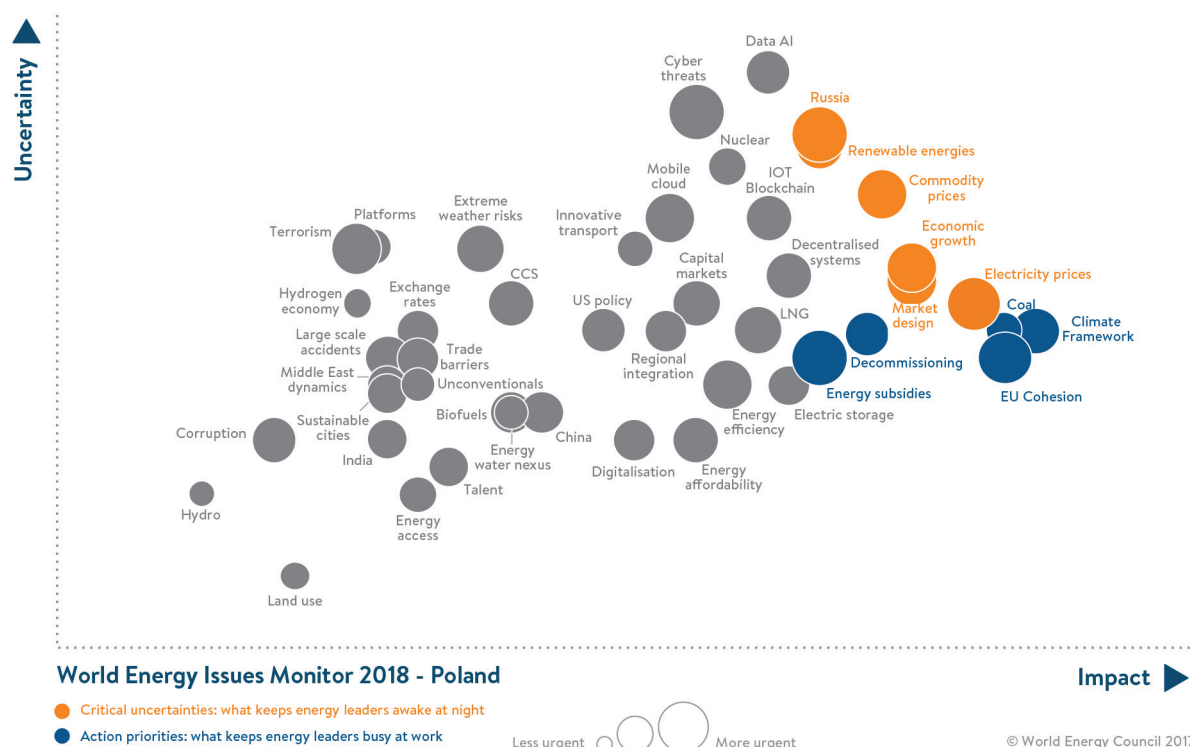
After **electricity prices** are de-regulated for all consumers in the next year, the Government is expected to decrease electricity prices for industry and increase prices for households, which identifies energy prices reform as an action in progress.

Finally, EU financial support for energy projects are exposed to decline in response to Brexit. As a consequence, issues like capital markets will be ones to watch as the impacts of the changing map of Europe start to influence project financing.

CONCLUSION

Lithuania's biggest challenge is energy self-sufficiency, whilst demand for energy is steadily increasing. The synchronisation of the country's electricity system with continental Europe is another important challenge. Lithuania will need to continue its efforts to harness the power of energy efficiency as a means to reduce its dependency on energy imports and therefore its vulnerability to commodity prices.

POLAND



NATIONAL OVERVIEW AND CONTEXT

The Polish energy sector is getting through a substantial and dynamic transformation. Changes are being carried out by the new government, which was elected in Autumn 2015. In 2017, the coalmining sector, which had a series of financial problems due to very low prices on the coal international market, has been thoroughly restructured. In the electricity and heat sectors, significant ownership changes were finalised. Two international players have left the Polish market and sold their assets to national companies controlled by the government, increasing a level of consolidation.

» The most important legislative initiatives in 2017 include a passage of the capacity market act and the electro-mobility act. The first one is aimed at ensuring mid- and long-term security of electricity supply in terms of generation adequacy. The capacity market, which is technology-neutral and market based mechanism, runs on pay-as-cleared auctions. The first auctions, on the delivery period 2021-2023, are to be settle at the end of 2018.

KEY ISSUES FROM THE NATIONAL MONITOR

The electro-mobility act establishes a framework for the development of electro-mobility in Poland and defines a market design for this industry. Although there is a clear definition for market design, the matter appears as a high uncertainty in the issues map, because in 2018, the Polish energy sector is expected to face a lot of challenges and strategic decisions. **Russia** appears as an uncertainty because it refers to the still unresolved Ukrainian conflict and the risk in ensuring

security of gas supply to Poland. Another uncertain issued related to Russia is the Nord Stream 2 project which is perceived as unfavourable to the Polish and the EU diversification and security of gas supply. **Commodity prices** are will continue to stay on the top of the agenda due to volatility and unpredictability of global markets (e.g. oil, gas, coal). It is perceived as a very important issue in Poland where more than 80% of installed capacity is coal based. Renewable energies are perceived as a **critical uncertainty** because of deployment of a new support scheme for renewable energy sources based on auctions and simultaneous collapse in green certificates prices. The latter ones are derivatives which are traded separately from produced energy and bring additional cash flow to renewable energy owners. High uncertainty in the **market design** relates to the negotiations of the European Commission's Winter Package and making up new European Grid Codes, which will define the new market design for many years. Finally, the **economic growth** reflects concerns on maintaining the Polish growth rate, which is one of the highest in Europe.

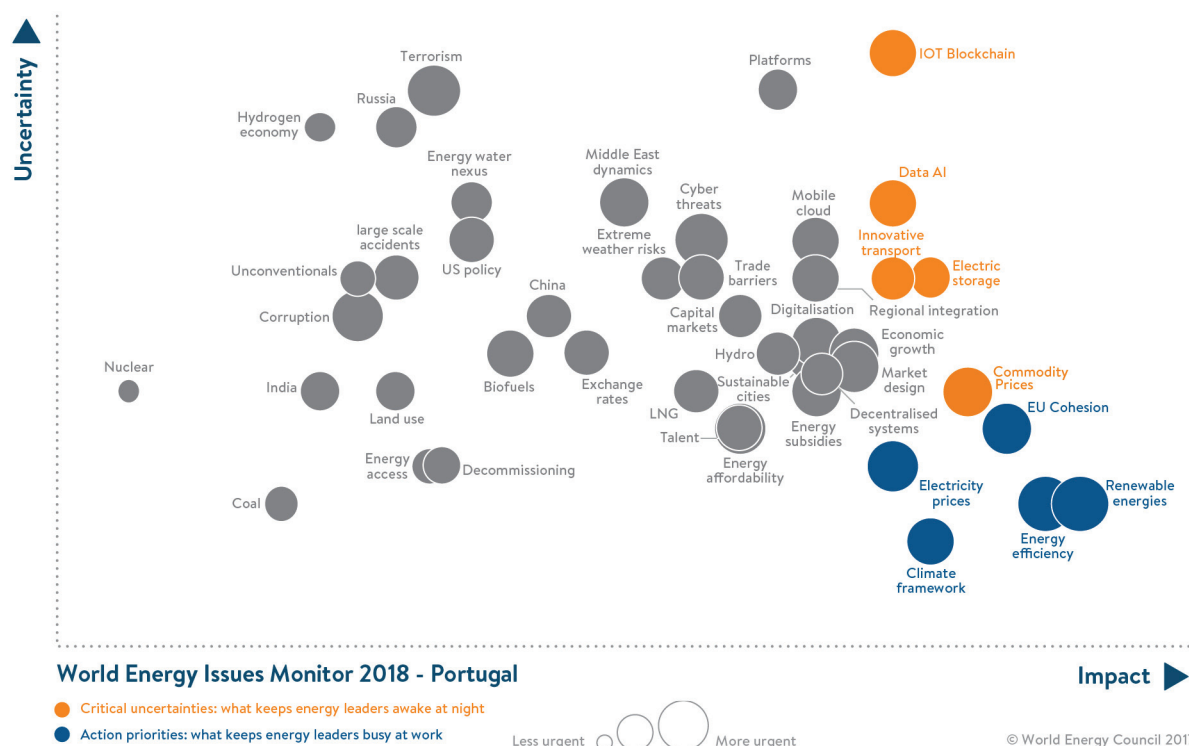
Climate framework, coal, EU cohesion, decommissioning and energy subsidies are the main action priorities for Poland. **Climate framework** concerns the next steps after the Paris agreement – negotiations and implementation of a new legislation. Coal is still a big issue in Poland as this is a strategic energy resource. General European policy combined with low prices on the international coal market caused financial problems in this sector. Recent restructuring actions brought the coal industry back to good economic condition. **EU Cohesion** in the energy sector seems to be very challenging issue considering diversity of primary energy sources and renewable energy sources potential EU countries. EU cohesion is the issue we must tackle in light of negotiations of the European Commission's Winter Package and making up new European Grid Codes. With regards to the **decommissioning**, the issue reflects existing missing money problem in conventional generation sector. This issue is to be solved by the deployment of the capacity market which ensures generation capacity adequacy.

CONCLUSION

The Polish map reveals also a group of issues with very high uncertainty and impact higher than average. These issues include: data AI, cyber threats, IoT blockchain, mobile cloud. All of them are associated with innovative features of the future energy landscape – digital, smart and decentralised. It is very likely, that in the next Issues Monitor these questions will be placed in critical uncertainties.

The biggest challenge on the international arena will be negotiations of the European Commission's Winter Package (Clean Energy for all Europeans) – a set of legislation to 2030 which is to transform European energy system in the broadest and deepest scope since the industrial revolution. The highest priority task is also to strive for the development of Baltic Pipe project which is aimed at ensuring diversity and security of gas supply. On the national level, the most important strategic decision concerns the first nuclear power plant in Poland including project finance. Moreover, it is also expected to finish the legislation process of the improved RES support scheme the new CHP support scheme. In 2018, Poland will be the host of the 24th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP24); Katowice, 3-14 December.

PORTUGAL



NATIONAL OVERVIEW AND CONTEXT

Renewable sources are gaining a major share in electricity generation in Portugal. PV, following in the footsteps of hydro and wind generation, is becoming increasingly present in the competitive electricity market. Nevertheless, with the uncertainties of future climate variability and extremes, gas power plants remain an indispensable part of the national mix of power generating capacity.

The main trends in 2017 for the Portuguese energy sector continued to be decarbonisation, efficiency, decentralisation and competition, in the search for a clean, affordable and secure energy supply. Distributed and micro generation are favoured, as well as consumer empowerment, in line with the European clean energy aims.

» In 2017, the power reserve required for the stability of the electric system received a new legal framework (Portaria 64/2017) which introduced a new mechanism for payments, based in a competitive bid process. The previous legal framework for the use of forestry biomass for electricity generation has not been adequately implemented. The Government issued a new regime (Decree-law 41/2017) which calls upon municipalities to build small scale power stations to utilise local forestry biomass. This is an important initiative to reduce the occurrence of forest fires and, also, to support local economies.

KEY ISSUES FROM THE NATIONAL MONITOR

A task force has been created (Lei 114/2017 December 29) to identify energy sector incentives which may have harmful consequences for the environment, with a plan to remove any such support. It will also investigate the implementation of a carbon tax, identifying its impacts in various economic sectors. Conclusions and recommendations will be published by July 2018. The implementation of these policies is reflected in the issues map, where **energy efficiency** and **renewable energy** appear as action priorities, showing that they are being actively considered as part of established and consistent policies.

Energy leaders' high expectations of possible disruptive game changers are reflected by the clustering in the 'critical uncertainties' quadrant of **IoT/Blockchain**, **data AI**, **innovative transport** and **electric storage**. There is little certainty about when, and to what extent, the first two technologies will become effective instruments for managing business in the energy sector, but their potential is recognised, which is why they are keeping energy leaders awake at night.

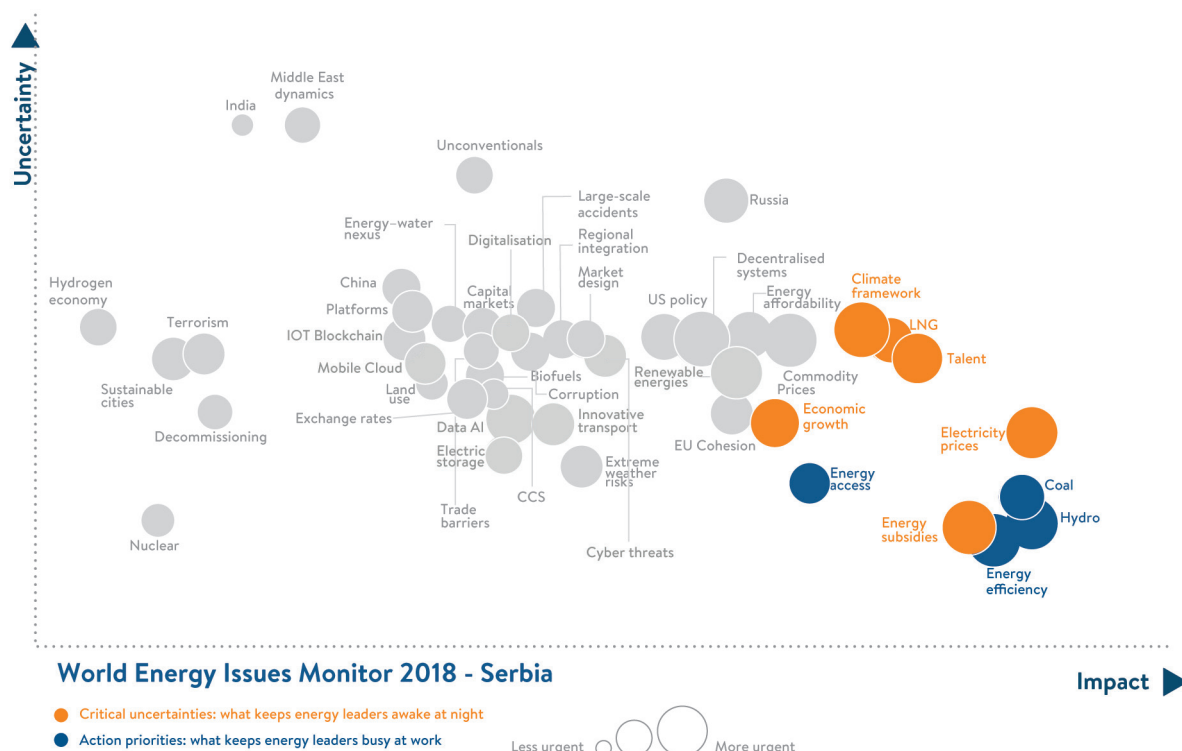
The downward travel of electric storage along the uncertainty axis, compared to the 2017 report, represents growing levels of confidence, showing that experts in the sector believe that the technology is increasingly becoming a real partner in energy generation and distribution operations. Innovative transport shows no significant change in relation to last year's issues map, suggesting that a rapid penetration of electricity in transport is not yet foreseen.

The **climate framework** issue is now a certain and ongoing task as policies and targets begin to mature across the EU. In relation to EU cohesion, it is noticeable that concerns are much lower in 2018 than in the 2017 Report, probably because of greater certainty around Brexit and the outcome of the French elections, with overall growing confidence in the European project.

CONCLUSION

Portugal is progressing quite well towards the energy transition, particularly in the decarbonisation of the electricity sector, where renewables represented 63% of the installed capacity in 2016, with 21.276MW installed, and 36% of gross electricity generation in 2017 originating from renewable sources. Large PV generation is securing investment from financiers confident in operating in an open and competitive market, without a feed-in tariff scheme.

SERBIA



NATIONAL OVERVIEW AND CONTEXT

Currently, in its accession talks with the European Union (EU), Serbia is obliged to transpose the EU's legislation into the national legislative system, thus involving a strong impact on its energy and environmental policy. In particular, the government is implementing its Action Plan on renewables with an aim to reach 27% share in the gross final energy consumption in 2020.

» In 2017, the construction works for a new 350 MW high efficiency and low emissions lignite fired power plant has begun, with a commissioning objective for 2020. Additional ongoing activities include the design and construction of seven wind parks totalling 550MW of capacity; five small biomass district heating plants; one waste to energy medium size plant; as well as 349 small and mini hydro-power plants. All these projects are entitled to subsidy support.

KEY ISSUES FROM THE NATIONAL MONITOR

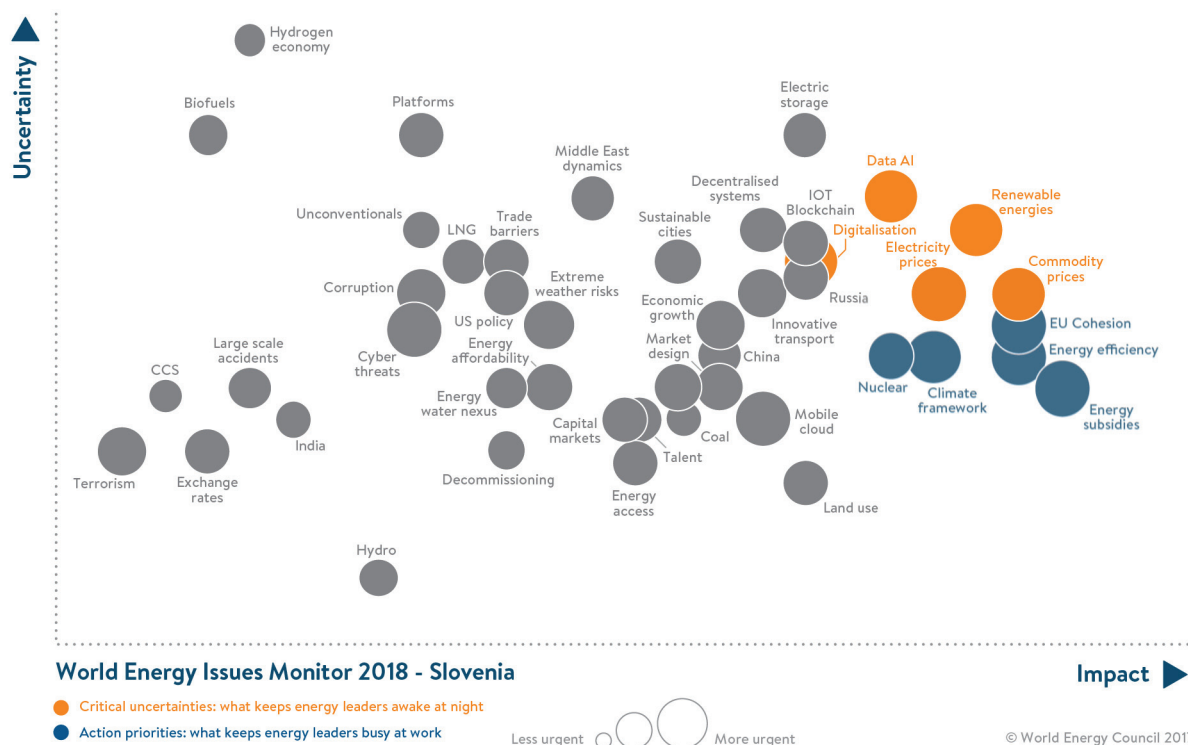
After submitting its Intended Nationally Determined Contribution (INDC) to the UN, declaring that the country will ensure a 9.8% reduction of the GHG emissions by 2030, Serbia is developing with the support of the European Union its Strategy and Action Plan on prevention of climate change. When adopted, the new law is expected to make a strong impact on the Serbian power sector, which today relies on thermal power plants fired by indigenous lignite for two thirds of its total capacity. The oldest of these plants, with total capacity 400 to 1000 MW, is scheduled for shut down by the end of 2023, while the remaining thermal power plants are being refurbished and equipped with the newly built systems intended to reduce emissions of dust and sulfur and nitrogen oxides so as to comply with the EU standards.

While the climate framework issue remains high as before, the impact of the **energy subsidies** grows with increasing the penetration of clean energy. The same applies to **electricity prices**, which are expected to rise towards market and cost reflective levels as the share of subsidised renewables grows. The impact of the **Talent** issue has grown recently, particularly after the Serbian Academy of Sciences and Arts found many deficiencies both in the educational system and in scientific work in the energy field. **Energy efficiency** became an action priority issue with even greater impact as the Decree on Energy Efficiency Criteria entered into force in December 2017. With an expected introduction of the emission allowances, imposed by the new Law on climate change, coal became an action priority issue. Hydro-power generation became a priority issue as well, as many small hydro-power plants are built by private investors without due care on their negative environmental impact, particularly on the local water supply and biodiversity.

CONCLUSION

Serbia is dependent on a single natural gas supply route via Ukraine, and is exposed to high risks of the current political crisis in the region. Even with its positive outcome, the risk still remains as the contract for gas transport from Russia over Ukraine expires in 2019, and its extension is not certain. Also, Serbia is particularly sensitive to the climate framework issue, because most of its electricity originates from coal-based thermal power plants. This issue is expected to be strongly addressed during the accession talks between EU and Serbia.

SLOVENIA



NATIONAL OVERVIEW AND CONTEXT

In 2017 energy consumption continued its upward trajectory in Slovenia. The country plans to upgrade its production and is looking at new hydro-power potential, especially on the Sava River and possibly a new unit at the existing location of the nuclear power plant. Slovenian national energy policies in 2017 were in slow but permanent adjustment toward a low-carbon economy. On a national level, Slovenia is committed to reducing GHG levels by 80% by 2050, relative to 1990 levels. This transition to a low-carbon economy assumes the continued use of nuclear energy as well as a systematic introduction of renewables. Natural gas will be used as a transition fuel. It also hinges on Slovenians reducing their energy consumption and increasing energy efficiency. The process of energy sector digitalisation is becoming systematic.

» In 2017 the government of Slovenia supported the binding EU target of at least 27% energy from renewable sources by 2030, but did not agree with a proposal to penalise countries that do not meet the target.

KEY ISSUES FROM THE NATIONAL MONITOR

Commodity prices and deployment of renewable energies are the critical uncertainties for Slovenia, as reflected by this year's Issues Monitor map. The possibilities for natural resources exploitation must reflect high standards of environmental protection and the potential scale of usable natural resources.

One of the most important potential energy resources is **hydro**. Steps are being taken to optimise existing hydro power production and to invest in small-scale hydro production, where it is environmentally and economical feasible. Use of biomass is still a challenge connected with environmental restrictions as well as forest and agriculture management. **Energy prices** are still affordable according to national economic indexes.

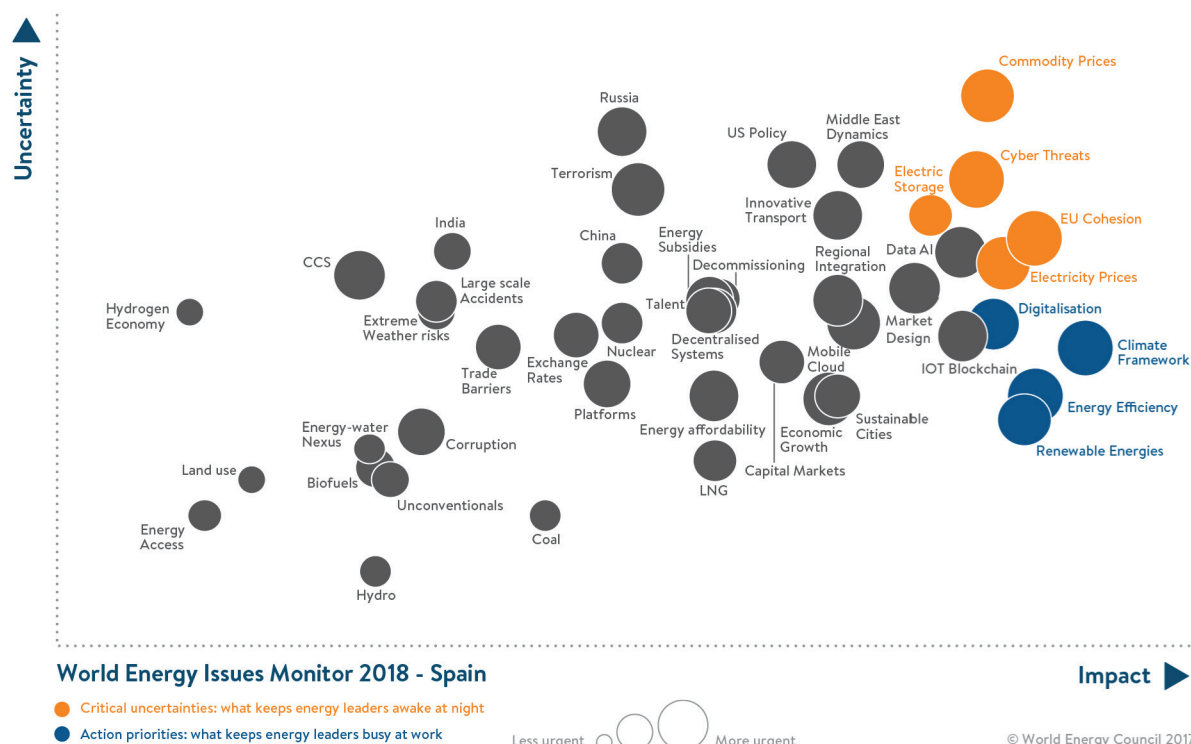
The due diligence policy of **energy subsidies** for renewables and **energy efficiency** is crucial for future national energy development. There is a risk of such issues becoming a future economic burden, consequently preventing investments in other energy activities, such as energy **digitalisation**. Balancing the impacts of these three action priorities is at the forefront of energy leaders' minds, illustrated by the clustering on the Issues map.

Another action priority to be addressed in coming years is the future energy mix, with a firm long-term decision to be made on the nuclear option.

CONCLUSION

While gas and oil markets are somewhat privatised, the government owns the majority of electricity production in Slovenia. Increased hydroelectric and renewable power generation, as well as smart energy use are action priorities for the Slovenian government, along with the development of an active electricity distribution network system. Significant investments were planned to modernise transmission and distribution systems, especially as regional smart grid projects and the completion of a 400 kV connection with Hungary, but the need to meet high environmental standards has delayed this important project. A new planned gas pipeline between Slovenia and Hungary will enable bidirectional gas flow in the Italy-Slovenia-Hungary corridor and will facilitate gas price convergence as well as the security of gas supply in the region.

SPAIN



NATIONAL OVERVIEW AND CONTEXT

One more year, the Spanish issues monitor map shows a great correlation between national, regional and international interests, although it also reflects the importance of some local aspects. The main highlights in Spain's energy context for the period are: the Catalonia's independence movement, the cyber-attack of May 2017 which affected several Spanish energy companies, the launch by the government of 8.000 MW of renewable auctions to be developed before the end of 2020 and the start of the approval process for a comprehensive Climate Change and Energy Transition Act to facilitate the compliance with the COP 21 Agreement and European commitments.

» Since 2016, Spain has been suffering from a severe drought forcing the wholesale electricity market into considerably higher prices due to lower levels of hydro production. Additionally, wind energy output declined as well, leading wholesale prices to the highest levels since 2008.

KEY ISSUES FROM THE NATIONAL MONITOR

Commodity Prices are appreciated as a critical uncertainty, in alignment with last year's Issues Monitor, and in response to a significant fluctuation of crude oil prices. An additional issue for Spain has been the increase in electricity prices, which is partially due to draught events and lack of wind.

EU Cohesion rises significantly this year, becoming a key uncertainty with substantial impact. 2017 has been characterised by the rise of social movements around EU Member States with general elections in different countries, the beginning of Brexit negotiations and, in the case of Spain, the Catalonia independence movement.

Market design and **electric storage** have been attributed with greater impact this year. The EU Commission Winter Package 2016 prioritises the rethinking of market design. This has stimulated debate in 2017 on the management of the electricity system with high shares of variable renewables and the encouragement of flexible mechanisms for better demand-side management. Complementarily, technology developments, such as **electric storage** play a key role in the Spanish system due to high participation of intermittent NCRE and insufficient interconnections.

Cyber threats have also increased in impact and uncertainty for Spain's energy leaders, as a consequence of the hefty cyber-attack of May 2017 which also inflicted several energy companies.

Climate framework appears as the most important action priority, as in the last edition of this report. The European Union has long been convinced of the importance and urgency of this issue, with Climate and Energy targets established for 2020 and now being established for 2030. Spain, as the other EU Member States, has been evolved in this process, and since March 2017 is developing a Climate Change and Energy Transition Law, with the objective to facilitate compliance with international and European commitments. The priority attributed to **renewable energies** and **energy efficiency** shows the country's commitment towards the 2020 and 2030 targets.

Finally, it is important to highlight issues such as **sustainable cities** - a topic that has moved from the weak signals where it had featured since 2014 to the need-for action area. Spain has led actions to promote this issue at the European level, including the Covenant of Mayors for Climate and Energy. **Talent** is also perceived with higher impact year after year. Its 2018 position underlines the need to search for qualified personnel with the necessary skills to face future energy challenges.

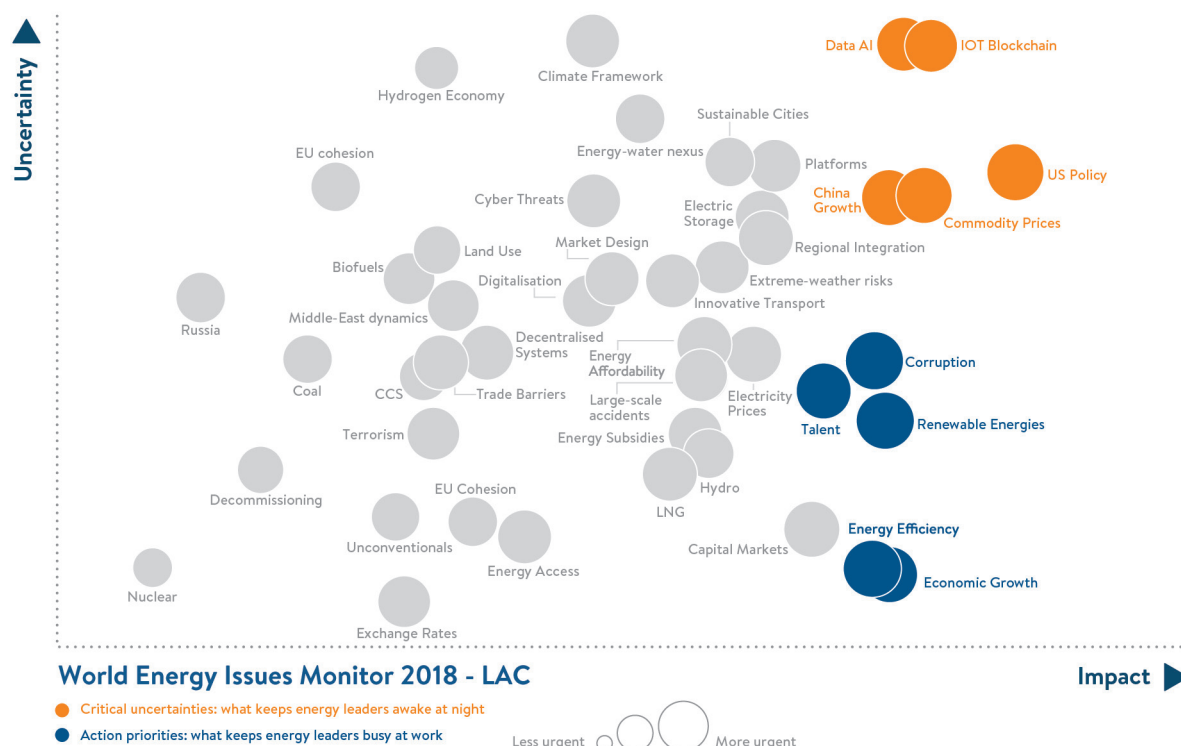
CONCLUSION

The energy issues for Spain and Europe are aligned for most of the key uncertainties and action priorities. However, the impact of the May 2017 cyber-attack on the country's energy industry has defined attention around this issue with particular significance for the Spanish energy stakeholders.

Assessing the energy agenda for Latin America and the Caribbean

LATIN AMERICA AND THE CARIBBEAN
ARGENTINA
BRAZIL
CHILE
COLOMBIA

LATIN AMERICA AND THE CARIBBEAN



Latin America and the Caribbean region (LAC), especially southern LAC countries are still dealing with the drop of oil and other commodities prices. This deeply affected the economies of many countries, especially those highly dependent on oil exports such as Brazil, Venezuela, Ecuador, Bolivia, Colombia and Argentina. This dependence affects the budget of these countries, generating instability, inflation, devaluation, and rising unemployment.

According to the regional map, there is a close link between commodity prices, electricity prices and regional integration. This creates opportunities for discussion about the critical issues which the region's energy leaders face. However, it is important to mention that low commodity prices have positively affected net energy importer countries in the region. Many of the Central American and Caribbean countries dependent on fuel imports to generate electricity have benefited from this situation.

A critical uncertainty that clearly increases in comparison to last year's map is **regional integration**. It appears that it could become essential to address some of the uncertainties shown in the map around issues including **extreme weather events**. Interconnections will be extremely important to address the El Niño phenomenon and avoid energy shortages in specific countries. The discussion on this critical issue could strengthen the relations between countries, contributing to reaching energy security in all national energy systems.

Regarding extreme weather risks, during this year, Latin America and the Caribbean have had to face hurricanes, earthquakes, floods in dry areas and extreme droughts in usually humid areas. Natural

disasters are an element that always strikes the region and is increasingly becoming a priority because of its devastating consequences. In energy matters, leaders must focus their efforts on ensuring resiliency to guarantee affordability and energy security after natural disasters occur.

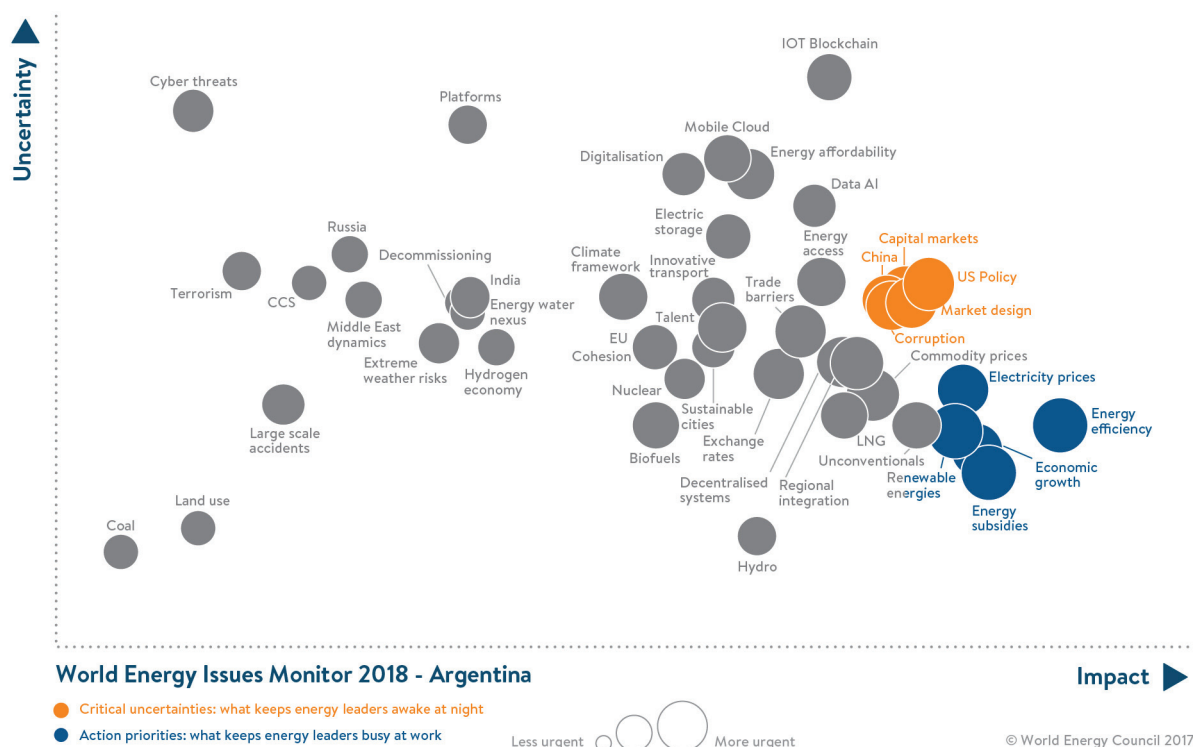
Renewables continues to be an action priority issue. LAC has a tremendous hydro potential. Countries such as Ecuador have implemented strong policies to take advantage of these resources, and at the moment, 78% of their energy matrix comes from hydro generation. Nevertheless, the risks associated with this hydro potential are closely related to the variability of hydrological cycles and extreme weather events such as El Niño. That is the reason why this is an area which requires action to adapt, and increase the resiliency of the energy systems, allowing the sustainable development of LAC's hydro potential.

Energy Efficiency is another action priority item in Latin America and the Caribbean. It is clear that it's not an issue which brings uncertainty, but which requires action to fully develop its potential. Ecuador has already taken the lead with strong policies in this regard with the substitution from gas-based cooking to efficient induction-based cooking appliances.

In addition, other countries such as Colombia and Chile are also increasingly addressing efficiency as it has become a key action priority. As a matter of fact, Colombia has also taken the lead on this issue, as shown by their e-mobility event that took place in September in Bogotá, where energy leaders on transport systems raised this problem, aiming to encourage decision-making based on innovative solutions.

Finally, an issue that needs to be a focus point for energy leaders is **corruption**, as it is constantly moving from an action priority into an uncertain scenario. Latin America and the Caribbean, has always faced critical corruption processes that are undermining the regional economic growth, since this generates political instability; lack of legal security and stops discussions and projects in energy matters which directly affects the local market, and therefore regional development.

ARGENTINA



NATIONAL OVERVIEW AND CONTEXT

Climate change isn't a major source of anxiety for most Argentines. A recent UADE-Voces! survey showed only nine percent considered it the most important global issue, behind drug-trafficking (18 percent), wars (14 percent), and human trafficking (10 percent), and just ahead of global hunger (seven percent). However, the government has committed to meeting eight percent of Argentina's electricity demand with renewables by 2018 and 20 percent by 2025. Argentina currently has just one percent renewable energy supply in its generation mix.

Argentina is more focused on energy prices and is working to restore its energy prices after the distortions generated during the Deep Crisis of 2002. Since then, populist policies have depressed energy prices, causing disinvestment, falling production and increasing imports of energy. Since 2015, the new administration has adopted a policy of gradual price restructuring aimed at strengthening the marketability of Argentina's energy industry while protecting economic growth. The greatest challenge is the strong resistance from the population towards the price increase and the consequent political cost of reforms.

» In December 2017 Argentinian government announced that it will raise the price consumers pay for electricity and natural gas. The Energy Ministry's decision comes as President Mauricio Macri's market-friendly government seeks to reduce subsidies for energy consumption as part of efforts to shrink the fiscal deficit.

KEY ISSUES FROM THE NATIONAL MONITOR

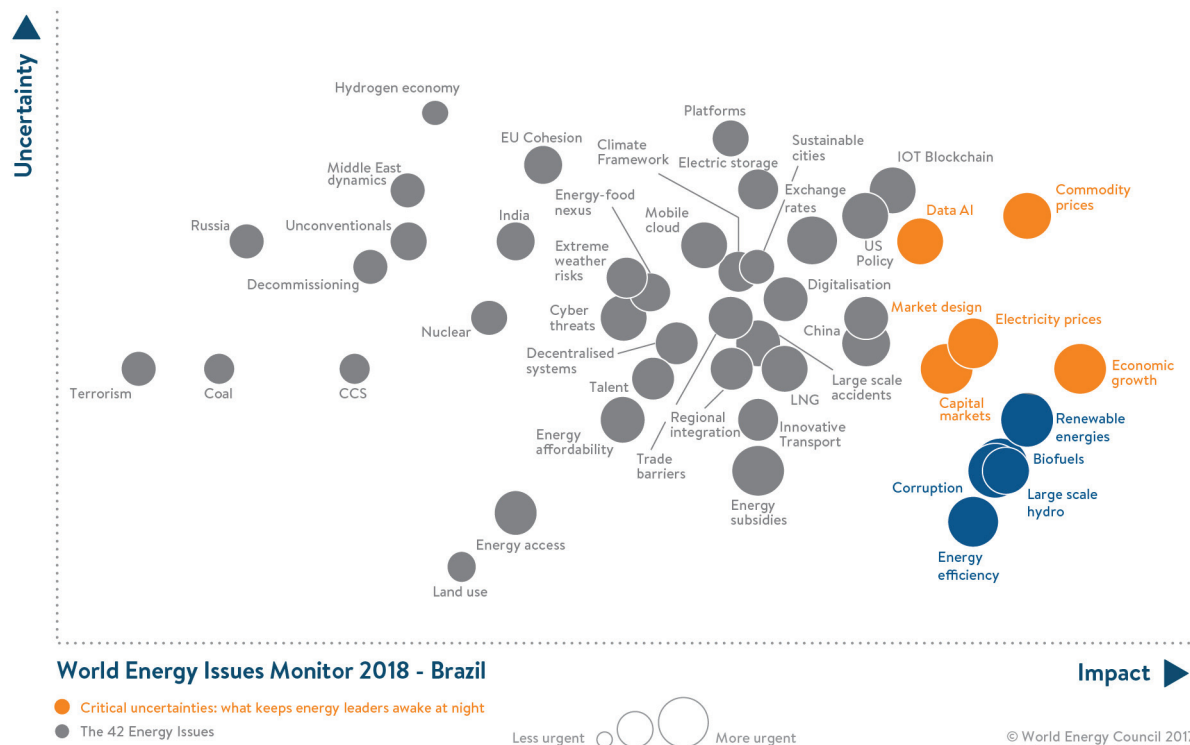
Since taking office in December 2015, President Macri has enacted a number of reforms aimed at bolstering the country's capital markets. Even so, **capital markets** are still a highly uncertain issue, because the reform bill that would undo some of former populist President Cristina Fernandez's interventionist policies has stalled in the opposition-controlled congress. Another uncertainty is Argentina's **market design** which currently is facing a number of challenges: a yearly increasing electricity demand, a strong dependence on fossil fuels and especially Argentina's dependence on their own natural gas reserves. In order to address these critical issues a new long-term strategy would be needed. That long-term strategy is being worked out in the near future.

The elimination of both fiscal and economic **subsidies** for energy consumption is a key issue that Argentina's energy leaders are facing today. The government expects to completely phase out consumption subsidies by the end of 2019. **Energy efficiency** was very neglected during the years of subsidised prices but the current administration has changed approach with the creation of the Undersecretary of Savings and Energy Efficiency, which is fully dedicated to developing policies and strategies promoting a "smart and responsible energy use". **Renewable energies** have had a great boost in the last two years and have received important national and foreign investments in photovoltaic and wind farms. Finally, the development of the great resources of shale gas and oil in Vaca Muerta is another challenge of Argentina. Currently the government subsidises the production of shale due to its high costs but with a plan to eliminate these subsidies in 2020.

CONCLUSION

Argentina is trying to rebuild its energy sector in order to regain the energy self-sufficiency that it enjoyed up until 2011. The institutional instruments to achieve this objective are in force and the challenge is to return to competitive prices and markets which have been sidelined during the economic emergency of 2002. The gradualist approach of the Macri administration implies greater political efforts but also avoids the recessionary shocks that the country experienced in its history.

BRAZIL



NATIONAL OVERVIEW AND CONTEXT

According to the Decennial Energy Expansion Plan for 2026 (PDE 2026), approved by the Brazilian government in 2017 and following the economic recession of 2015-16, the expansion of domestic energy supply will be able to meet demand growth (2.3% pa) and the expansion of installed capacity will allow renewable sources to continue representing more than 80% of the energy mix. The production of oil in 2026 is estimated at 5,200 thousand barrels per day, consolidating Brazil as an oil exporter.

» The medium and long-term vision of the Brazilian energy sector is to prioritise the development of available energy resources. The short term is marked by political initiatives such as the Car Wash anti-corruption operation and the General Elections in October. This reinforces critical uncertainties as the necessary reforms are not expected to be concluded in the current year.

KEY ISSUES FROM THE NATIONAL MONITOR

2018 data indicates that the Internal Energy Supply could grow slightly above 2%, in line with the expected economic growth of about 2.8%. Still, goods consumption and private investment have negatively responded to the slow progress of ongoing economic reforms and the Car Wash operation. Anti-corruption investigations will particularly impact the performance of presidential candidates in the upcoming October elections.

The depreciation of iron ore and oil have raised the level of uncertainty around **commodities** in Brazil, especially due to their important share of the national exports. This issue is of particular relevance as Brazil has been consolidating itself as an oil exporter, with an average export of 722 thousand bbl/day in the period 2015 -16 and 1 million in 2017. On the other hand, the devaluation of the Real against the US Dollar is playing in favour of Brazil's commodity exports in 2018.

Electricity consumption increased by 0.8% in 2017, signalling a progress against economic recession. High electricity taxation and subsidies for power generation have negatively impacted progress on energy efficiency and helped to perpetuate electricity prices which are among the highest in the world. **Hydro** generation decreased of 3.0% in 2017 compared to 2016, especially as a result of reduced reservoir storage levels in response to extreme weather events. Such events are a constant challenge to the stability of Brazil's largest power generation resource. Lack of integrated management of water use and investment in household sanitation along with the increased use of water in irrigation in agricultural areas substantially aggravate the problem.

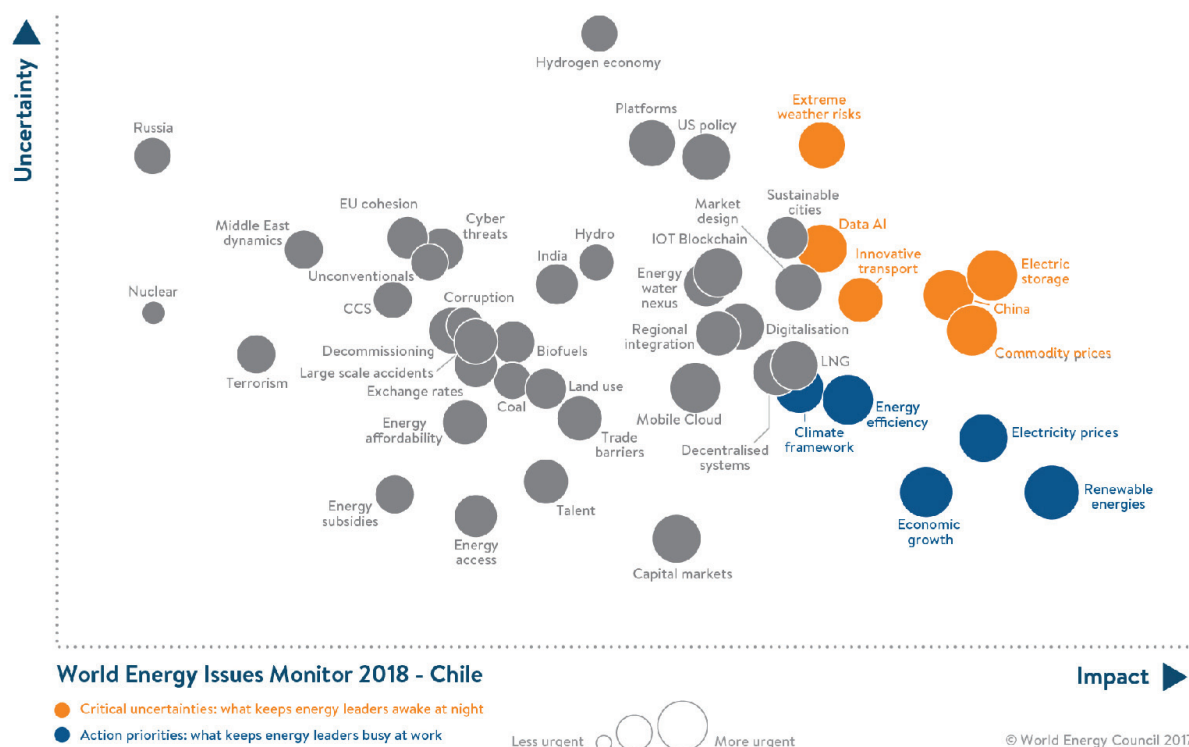
The installed capacity of wind power in Brazil reached 12,294 MW (7.8% of the total) at the end of 2017, an increase of 21.4% compared to 2016. This upwards trend of **renewables** integration in the mix is expected to continue in 2018 and in subsequent years. In the same way, the capacity of solar energy generation also has great growth potential. At the end of 2017, 1,097MW of solar capacity had already been installed.

The consumption of ethanol (hydrated alcohol) in 2017 was 13.64 billion litres, against the demand of 14.59 billion litres in the previous year. Ethanol prices have not been competitive in all regions compared to gasoline prices, which follow the levels of the international market. However, ethanol production (anhydrous and hydrated alcohol) totalled 26.09 billion litres in the 2017-18 harvest - about 1.72% higher than the previous year. In the area of biodiesel, the recent behaviour and prospects of production and consumption are positive: as of March 2018, all national diesel oil has a blend of 10% nationally produced soy-based biodiesel.

CONCLUSION

Political instability hinders the advancement of the necessary economic and social reforms, including those of regulation in the area of energy. However, in the medium and long-term, Brazil has a great potential to improve its position in the Energy Trilemma index. Energy security will be strengthened by increasing production of oil and natural gas, reducing dependence on imports gas and oil products; energy supply will be more diversified with increased generation of renewable sources such as solar, wind and biomass. With the reforms in the electricity sector implemented, there will be greater competition among electricity suppliers, leading to a reduction in prices to final consumers (taxes and subsidies) and a better quality of energy supply, factors that will improve the accessibility of electric energy. Finally, environmental sustainability will also benefit from the internal supply of energy with more than 80% of renewable sources sustaining the country's economic growth.

CHILE



NATIONAL OVERVIEW AND CONTEXT

By 2025, Chile's clean energy generation is expected to surpass the 20% target (excluding hydro power). Chilean officials have announced that by 2050 the country is on track to rely on clean sources for 90% of its electricity needs (including hydro power)¹. To this end, the newly appointed Energy Minister, Susana Jimenez Schuster, said that the government's vision is for Chile to be "at the forefront of energy modernisation, which is advancing by leaps and bounds in the world. We believe that technologies and innovation should be at the service of citizens and improve their quality of life."² This explains why technologies such as electric storage and innovations in transport and data are among the top critical uncertainties for Chile's energy leaders, as highlighted in this year's Issues Monitor.

» A key development in 2017 for Chile was its integration of their two formerly separate transmission grids potentially resulting in greater reliability and reduced costs. Moreover, regional integration has become a priority as Chile looks to optimise its energy system.

KEY ISSUES FROM THE NATIONAL MONITOR

The Issues Monitor tracking reflects the evolution in generation and growth of non-conventional renewable energy (NCRE) in Chile's electricity mix. Since 2010, concerns about coal, hydro and energy affordability have completely moved out of the critical uncertainties quadrant and attention has focused on new issues.

1 - The Santiago Times, January 14, 2018

2 - BNAméricas, March 15, 2018

With the rapid growth of solar and wind power in Chile's energy matrix and the goal to add 20% of NCRE to the electrical system for the year 2025, access to viable electric storage solutions to partner with this development rises as a critical uncertainty. As a key green energy trading partner, China represents opportunity and uncertainty for Chile's energy leaders – the opportunity of accessible energy products and services, and the uncertainty on the efficiency level of such products, with imports from China increasing participation in the local industry.

The shifting focus from reinforcing generation to enhancing efficiency has prompted questioning around **big data artificial intelligence (AI)** as smart technologies begin to be incorporated. AI software solutions will be critical in solving issues arising from the integration of NCRE into the grid through improved analytics. The focus on efficiency and innovation extends through the transport sector as the country plans to achieve “the highest international standards of energy efficiency for road, air, rail and maritime transport” with its Energía 2050 long-term policy plan³. The ambition for **transport innovation** raises questions around the possible bumps in the road towards this progress.

Extreme weather risks remain as previous years, a top critical uncertainty as Chile's exposure to the El Niño and La Niña weather phenomenon which is a cause of rainfall deficit. Correspondingly, the volatility of **commodity prices** also stands uncertain, with imported LNG being a source of safe supply in the events of unavailable hydro power. The impact of gas price volatility is enhanced this year with the resume of LNG exports to Argentina during the winter period.

The successful inclusion of NCRE in the mix helped to increase certainty around **renewable energies**, **electricity prices** and **climate framework**. These issues, aligned with energy efficiency and **economic growth** are the top action priorities this year's Monitor, indicating a coherent pathway with the Energía 2050 plan towards a “reliable, inclusive, competitive and sustainable” energy sector. The plan is currently in its fourth year of implementation and includes policy directions and incentives for private sector engagement. In addition, August 2017 saw the inauguration of Chile's national action plan on climate change for the period 2017-2022, which focuses on four themes: adaptation, mitigation, means of implementation, and climate change management⁴. A key ingredient for successful fulfilment of Chile's objectives will be the ability to capitalise on this political will and public-private collaboration, as the private sector buy in will be essential to achieve the ambition for an efficient, equitable and sustainable energy performance.

CONCLUSION

Chile's 2017 Issues Monitor describes a great focus on the three dimensions of the Energy Trilemma: efficiency, equity and sustainability. Although the three dimensions are represented among the country's action priorities, the critical uncertainties revolve around innovations and technologies which are ultimately new contributors to the evolution of Chile's energy system. The map highlights a coherence in focus and objectives as a new administration takes the lead.

3 - Energía 2050, Chile <http://www.energia2050.cl/en/>

4 - Climate Observer, August 3, 2017



» In 2017 the Ministry of Mines and Energy announced that new electrical transmission lines will connect the northern Guajira peninsula to the rest of Colombia. This project will help diversify Colombia's energy basket and should be completed by 2022.

The Colombian energy basket, mostly hydroelectric, is very vulnerable to **extreme weather risks**, which are increasingly frequent and severe. Significant weather variations, like the “El Niño” phenomenon, alter the country’s hydrological cycles and compromise not only the generation of energy but also all the sectors that depend on this important resource, such as water. This dependency is reflected in the critical uncertainty of the **energy-water nexus**, represented in close proximity to both weather and climate issues in the high impact quadrant of this year’s Monitor.

89

left quadrant of the Monitor since its previous iterations. Enabling this transition will also ensure Colombia's modern energy services comply with international commitments on environmental management and the climate framework. The task of leading the country along the path towards greater well-being and achieving a more competitive productive sector for **economic growth**, is keeping Colombia's energy leaders awake at night.

Colombia is currently working on the policy framework to drive investments in non-conventional **renewable energies**, without losing sight of the need to guarantee the reliability of the system and promote **energy efficiency** measures as a priority action, especially in industry.

The legislative framework to promote the development and use of renewable sources in the national energy system has existed in Colombia since 2014, with subsequent resolutions to regulate small-scale self-generation and distributed generation in the National Interconnected System. The development of these legal instruments brings clarity and certainty to **decentralised systems**, which explains its recent shift down the impact scale of the Issues Monitor. In the long term, decentralisation will mean greater user participation through the sale of surplus energy to the network, the development of new technologies such as smart grids and electric transport, and real empowerment of end users with intelligent metering infrastructure.

One aspect that has been changing over the years between weak signals and critical uncertainty is **corruption**. Its high prominence in this year's monitor reflects the landscape after the peace process, when people's eyes have focused on outrage over **corruption** related to the transparency of entities, weak control exercises and greater inequality. This is a critical issue that must be addressed for the prospect of creating a transparent foundation for investment and the country's development in the short, medium and long term.

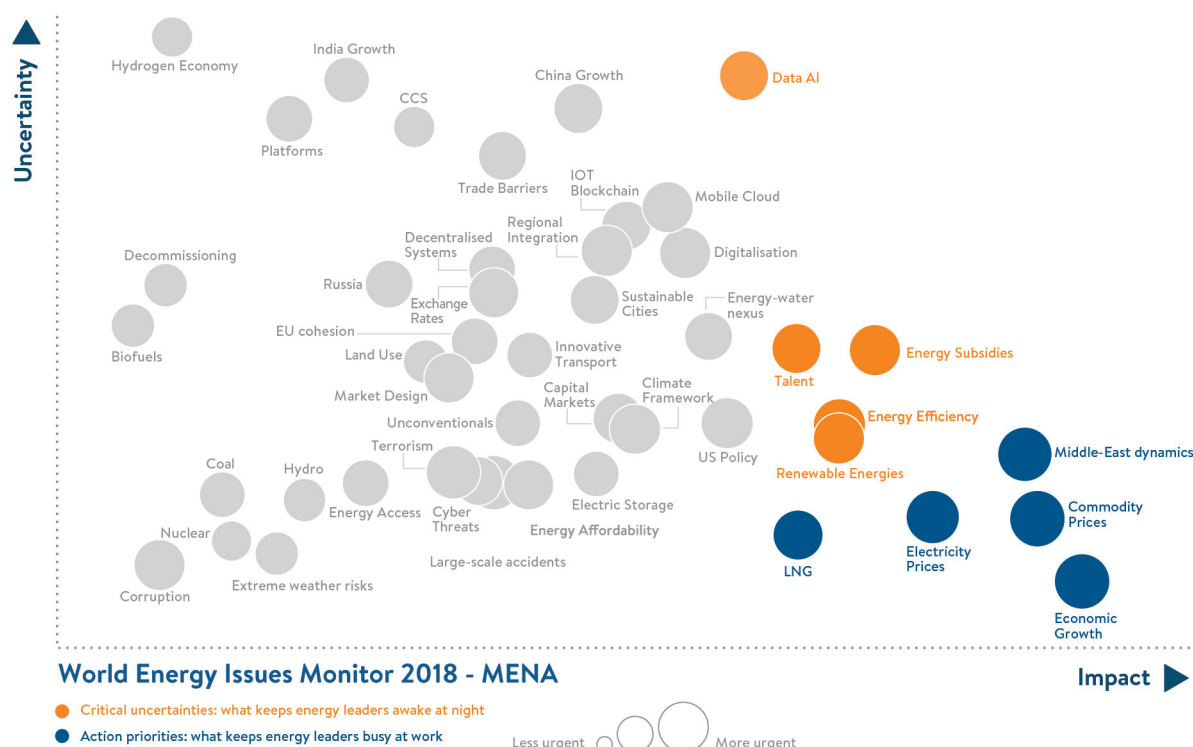
CONCLUSION

With focus and action priority drives, the future looks promising for more renewable energy generation and its diversified benefits for Colombia's energy sector.

Assessing the energy situation for the Middle East

MIDDLE EAST
LEBANON

MIDDLE EAST AND NORTH AFRICA



The year 2017 was marked by a relative degree of stability in terms of energy matters in the MENA region as witnessed by the lack of issues in the quadrant of critical uncertainties. Historic issues of concern such as Middle East dynamics, commodity prices, economic growth, electricity prices and LNG remain high-impact areas but fall sharply in terms of uncertainty, reflecting a degree of maturity as policymakers learn to live with cyclical issues of concern.

Middle East dynamics, historically a proxy for wider geopolitical tensions outside the GCC (Gulf Cooperation Council), came closer to home in the wake of the decision by Saudi Arabia, UAE and Bahrain to place Qatar under a trade and air embargo. Many of the Issues Monitor respondents are part of the GCC, and it is noteworthy that while Middle East dynamics rose in impact, it fell in uncertainty, possibly reflecting that most of the GCC believes that an early resolution to the issue is unlikely. However, the political situation with Qatar has not impacted **regional integration**, which remains little changed as an issue of moderate impact and uncertainty. This is surprising because Qatar, with its surplus of gas and generating capacity, is a potential nexus for increased regional integration.

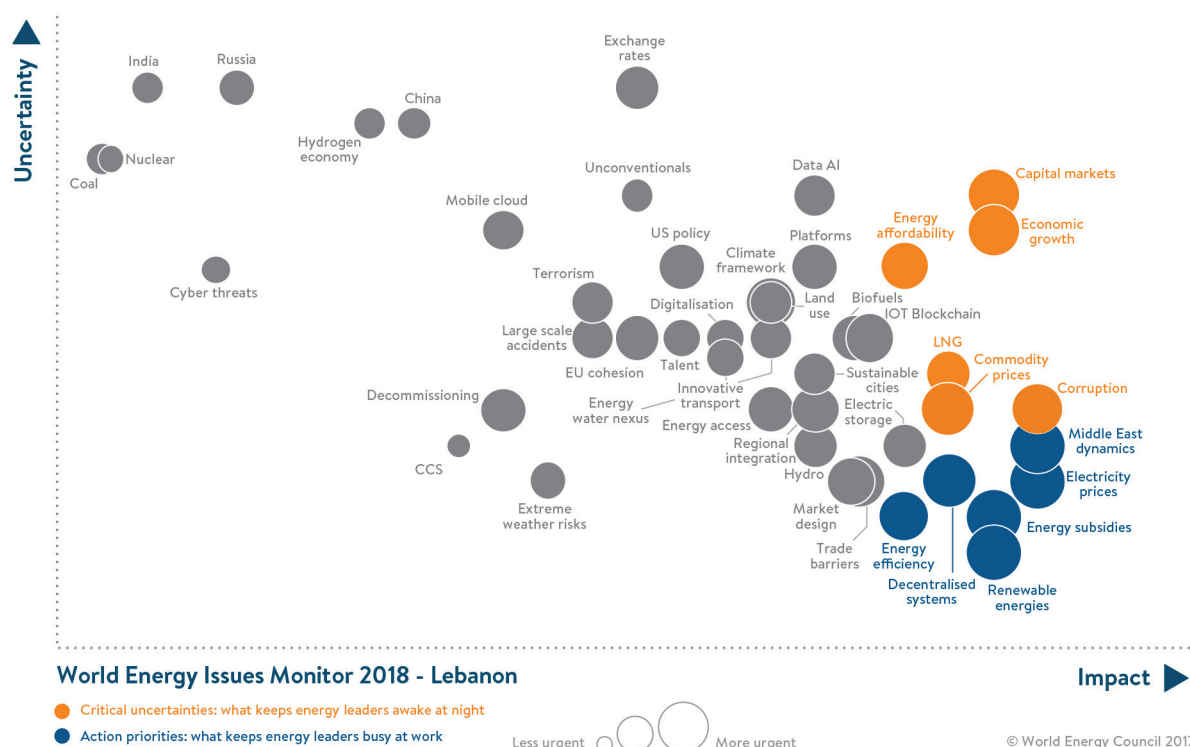
Core domestic economic issues such as economic growth, electricity prices and **commodity prices** remain as topics of utmost importance for policymakers, but their low level of uncertainty shows they are issues that governments feel can be taken in stride. These issues are closely followed by a cluster of domestic issues such as renewable energy, energy efficiency, energy subsidies and talent, all of which suggest that getting the local economy on the right track outweighs international concerns.

LNG continued the trend witnessed in recent years of rising in impact and falling in uncertainty. Supply of natural gas remains a key regional issue as domestic supplies fail to keep pace with burgeoning demand, but the easy availability of LNG imports from outside the region means that buyers are relatively relaxed about the status quo.

Noteworthy is the region's lack of interest in issues related to the energy transition, notably **climate change** impacts and decarbonisation challenges. Extreme weather risks, innovative transport, climate frameworks, CCS and competing fuels such as nuclear, hydrogen, hydro and coal all rank low in terms of impact despite varying degrees of uncertainty, suggesting that the region is not particularly concerned about the energy transition.

The new generation of technology-related issues offering potential opportunities, such as decentralised systems, blockchain, mobile cloud and digitalisation, all appear on policymakers' radar screens. While there is high uncertainty for these issues, the impact is high enough to suggest that policymakers are aware that disruptive technologies represent an opportunity that could be harnessed by national economies. Already, evidence on the ground suggests that private and state-owned companies in the power sector are moving down the route of digitalisation as a means to maximise operational efficiency and optimise energy consumption

LEBANON



NATIONAL OVERVIEW AND CONTEXT

Although the government is working very hard to make large investments to update the outdated electricity infrastructure most Lebanese regions experience 10 to 12 hours of electricity rationing a day, and these power cuts increase dramatically in the event of malfunctions in any of the ageing plants. It is common for residents to pay additional costs for external generators to compensate for frequent power cuts. However, there is much hope and an obvious trend to increase the inclusion of the production of renewable energy as part of the implementation of the national electricity strategy.

In 2017, a 10-year reform plan proposed by the Minister of Energy and Water (MoEW) was approved by the Council of Ministers. The first phase of the plan involves the lease of two additional power barges from the Turkish company that already operates two smaller ships in Lebanon, and the activation of the two recently overhauled power plants with the aim of increasing electricity supply to 21 hours a day this year. The main idea behind the leasing of the barges is to give the MoEW more time to build new power plants that can provide all of Lebanon with 24 hours of electricity in the future. The two additional floating power plants will reportedly generate up to 890MW at a cost of US\$340 million a year. The plan also envisions the construction of solar power plants in several areas in the country.

» The year 2017 has witnessed a historic moment in the development of renewable energies in Lebanon: the first decision in over 50 years to build large centralised renewable energy farms in the country. During its meeting on Wednesday, 12 July 2017, the Council of Ministers (CoM)

of Lebanon approved the construction of three wind farms by the private sector in the area of Akkar, North Lebanon. The three wind farms will be built by three different consortiums and will have an overall capacity of 200 MW.

KEY ISSUES FROM THE NATIONAL MONITOR

As for the field of **commodity prices**, the uncertainty has decreased from 2017 issues monitor due to some improvements the sector witnessed in the past year. On September 2017, the Lebanese Parliament approved the law on tax provisions related to petroleum activities in accordance with Law 132/2010, which was submitted by the CoM. As a result, the approval of the Petroleum Tax Law completes the legal framework governing the oil and gas sector in Lebanon allowing pre-qualified companies wishing to participate in the First Offshore Licensing Round to prepare their bids accordingly. In addition, on December 2017, the CoM approved the awards of 2 exclusive petroleum licenses for exploration and production, namely in blocks 4 and 9.

LNG is expected to play a big role in the supply and reliability of Lebanon's electricity future. A tender was launched for 3 offshore degasification terminals in 3 different locations in Lebanon to serve the power sector with Liquefied Natural Gas (LNG). Another tender was launched for the establishment of a storage farm covering 400,000 m³ in Tripoli, North Lebanon. However, LNG is a high uncertainty item because of Lebanon's refusal to assume any price or supply risk for the LNG or to pay upfront for infrastructure costs may dampen companies' interest.

On a national scale in 2018, **biofuels** shifted from a low impact/low uncertainty to a higher impact and uncertainty. This is because of the high importance of diversification in the energy mix. However, the biofuels are not on the priority list and its economics are yet to be studied in the country.

Comparing the 2017 issues monitor, **renewable energy** in Lebanon takes the lead in the action priorities. Lebanon's commitment to 12% renewable energy by 2020 is on the right path and all actions, both from the private and public sectors, are focused on expanding investments in this field. The Government of Lebanon took this commitment to the next level, by pledging to increase the renewable energy share to 15% by 2030 at the COP23 in Paris in November 2016. **Energy efficiency** and renewable energy strategies for Lebanon are documented in two official documents prepared by the Lebanese Center for Energy Conservation (LCEC) and approved by the CoM: The National Renewable Energy Action Plan 2016-2020 (NREAP) and the National Energy Efficiency Action Plan 2016-2020 (NEEAP). This further confirms the government's adopted systematic approach to reach national goals. The launching of these action plans in addition to the deficit in electricity supply has set the ground for many renewable energy initiatives.

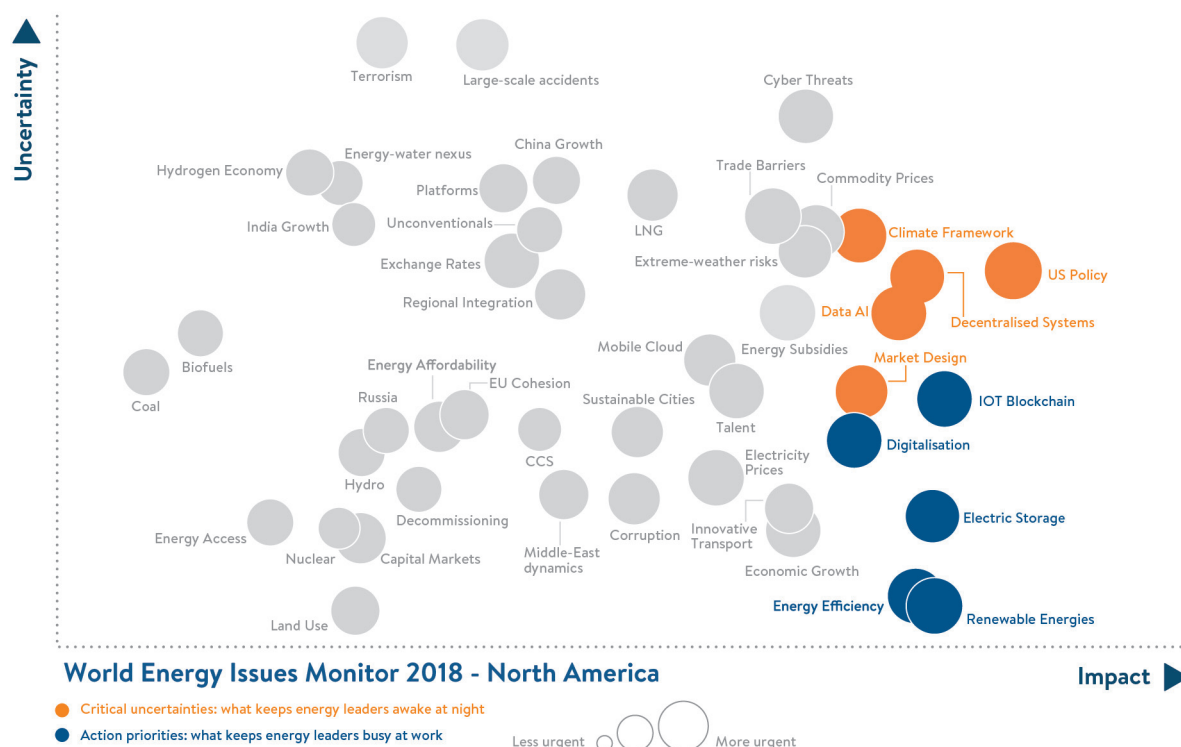
CONCLUSION

The Lebanese energy and electricity sector is currently witnessing drastic progress and will continue to prioritise its renewable energy commitment as it works to bring 24 hours of electricity access to all of Lebanon.

Assessing the energy situation for North America

NORTH AMERICA
CANADA
MEXICO

NORTH AMERICA



North American oil and gas production continues to increase while electricity systems evolve toward cleaner options. The economies of the three countries are significantly based on production and export of energy commodities drawn from their rich endowment of fossil, renewable and nuclear resources. In general, the region is characterised by sustained reliability, reasonable energy prices, and a continued push toward cleaner energy policy, particularly at the sub-national level.

North America is decentralising electricity generation systems while also growing and refurbishing traditional sources toward reducing greenhouse gas emissions. While recent US Federal policies place greater emphasis on traditional generation sources, the majority of US states are aggressively pushing toward embracing cleaner electricity choices. Mexico's energy reform, which allows private sector participation in the oil, gas and electricity markets, is dramatically reshaping their energy industry. Mexico is also very focused on continued digitisation of its electricity system. Canada is a significant exporter of fossil fuels and electricity, primarily to the United States.

Whereas Mexico's energy reforms, designed in part to introduce competition into oil and gas and electricity markets, and Canada's plans to adopt a national carbon price topped North American headlines in recent years, evolving US energy policy is currently the leading "high impact – high uncertainty" item. Similar to 2016, the 2017 Issues Monitor continues to highlight **US Policy** as a highly uncertain and impactful area that keeps policy makers, innovators, and market leaders on edge. An interesting shift from 2016 is that in 2017 **commodity prices** are not seen as a critical uncertainty, most likely due to the stabilisation of world oil prices after the crash a few years ago.

Decentralisation of electricity generation and the consequent changes to the configuration and operation of the grid, appears as a critical uncertainty. However, it is not entirely certain how decentralisation will help or hurt the ability of policy makers to implement clean energy policies. In the past, clean energy policies could be pushed through vertically integrated utilities. Now, decision-making is much more decentralised, making policy design and implementation more complex. The United States, Canada and Mexico are all demonstrating progress in developing decentralised electricity generation. Canada, in particular, continues to invest heavily in traditional, centralised options like building new, HVDC-connected hydro-power and refurbishing Ontario's significant nuclear power generation facilities. Eight out of ten of Canada's top infrastructure projects are directly related to the large-scale provision of clean electricity and represent a total current investment of almost \$70 billion dollars CDN.

There continues to be a major change in the development of oil and gas in North America. Mexican energy reforms and US deregulation signal new oil and gas investment for these two countries. New natural gas and oil shale production in the United States is turning the country into a petroleum exporter. Canada, who traditionally viewed the United States primarily as an oil and gas customer, is increasingly seeing the US as a competitor. Mexico promises to become a greater investment destination for both countries.

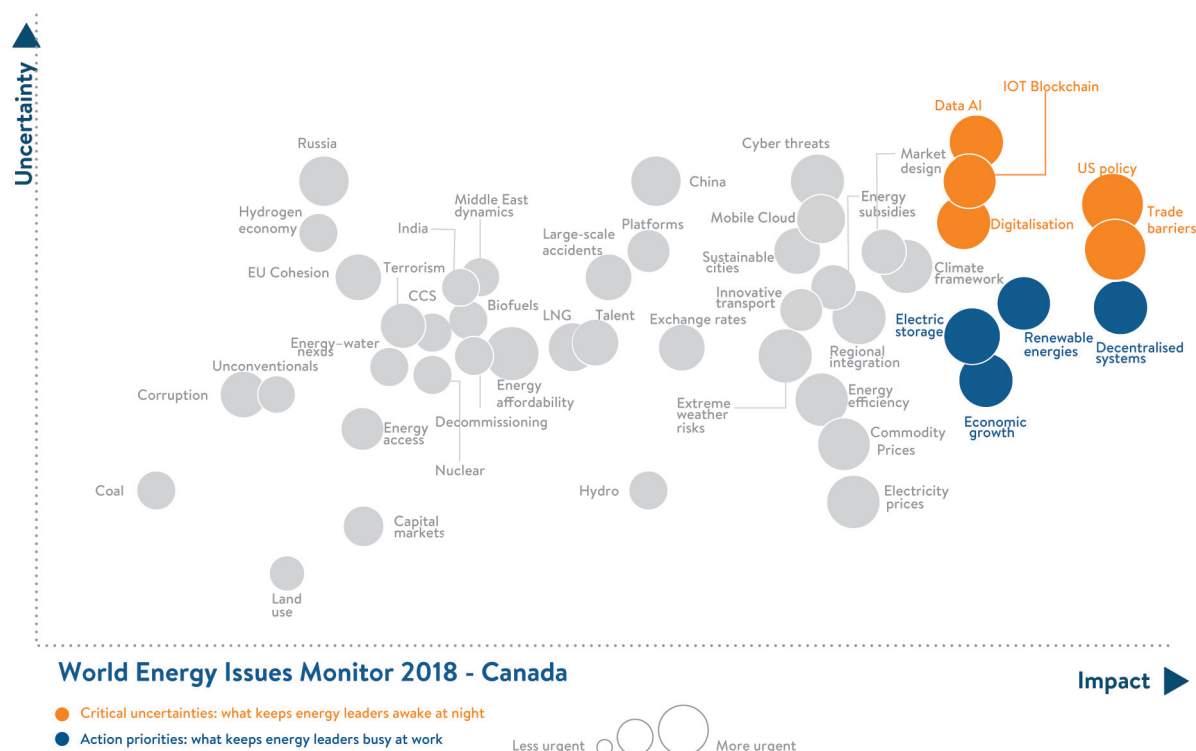
Given these new realities, access to new foreign markets has become a pressing necessity not just for the Canadian oil and gas industry but also for Canada as country. Canada's internal politics are making construction of a new pipeline which will provide access to tide-water extremely difficult. This materially restricts exports to new Asian markets. It also results in Canada receiving a significant discounted price on its current petroleum exports which can be as much as 20% to 40%. Indeed, pipeline politics in Canada could very well test the strength of the federation itself not to mention its traditionally positive investment reputation.

In addition to issues related to the decentralisation of electricity generation, other areas of critical uncertainty are categorised as: Climate Framework, Market Design and Data Security. **Electricity Storage**, identified as a critical uncertainty in last year's Issues Monitor report, now appears as a somewhat lesser North American concern. This is most likely because significant storage capacity is now coming on-line. During the third quarter of 2017 for example, 41.8 megawatts of energy storage was deployed across the US. According to GTM Research, approximately 295 megawatts of energy storage will be deployed in 2017 in the United States. This is a 28% increase from 2016. This is why electricity storage has moved from a critical uncertainty into an action priority for energy leaders. More and more utilities are relying on electricity storage in their long-term resource planning processes as intermittent and variable generation from wind and solar power increases. Canada maintains a continental advantage in electricity storage given its world-leading installed and undeveloped hydro-power capacity.

Energy leaders continue to see cyber security as a significant source of risk to energy production and to pipeline and electricity transmission systems. Addressing these concerns is the growing continental-scale integration of energy systems which provides the potential for increased reliability in the event of cyber-attack; Mexico recently joined the North American Electric Reliability Corporation.

Another action priority appearing in the Issues Monitor is the advent of the Blockchain. There are currently 122 Blockchain start-ups in the U.S. energy space and every day the number is increasing. Last January there were only 54 such companies. There are many pilot projects underway, designed to better understand the feasibility and scalability of this new technology. Canada's Alectra Utilities in partnership with IBM is planning to test demand response settlements using Blockchain. The US Department of Energy and the US Department of Defence are looking to develop blockchain-based cybersecurity technology for the electricity grid. In México, it is possible that demand response aggregators will start exploring the use of Blockchain technology in the near future.

CANADA



NATIONAL OVERVIEW AND CONTEXT

Energy activities are major contributors to resource development and economic growth in Canada, making up 7.3% of GDP and over 280,000 jobs. Given energy's important role, the responses from energy leaders on today's issues are particularly relevant.

The US oil and gas supply bubble has reduced demand for Canadian exports. Increased natural gas imports from the US northeast into eastern Canadian markets have further reduced domestic natural gas demand and exports to US markets. The contribution of energy trade to the balance of payments has declined due to the deep price reduction of Canadian bitumen, a consequence of insufficient national pipeline capacity. Although projects to expand existing pipeline capacity have received Canadian federal regulatory approval, construction has not yet commenced.

In the electricity sector, market players are adjusting to ongoing transitions including: clean generation, decentralisation, and new energy storage services. In parallel, market operations are being transformed by digitalisation and early experimentation with Blockchain technology.

» Climate Policy remains the focal point of energy dialogue in Canada. The provinces have implemented climate policies matched to their particular resource endowments and policy preferences while the federal government is legislating a national climate policy featuring carbon pricing; an unsettled situation prevails.

KEY ISSUES FROM CANADA'S NATIONAL MONITOR

Prior to 2017, there were many parallels between the national **climate policies** of Canada and the United States. More recently, there has been significant divergence because of changes in policy directions by the US federal administration. National and subnational alignment or dissonance regarding energy policy can be a persistent feature in relations between countries, especially federations. Canada, the United States and Mexico are currently grappling with this reality.

In contrast, close similarity prevails between climate policy initiatives implemented by many US states and by Canada's provinces. An example is the cap and trade mechanism operating now amongst California, Québec, and Ontario.

Uncertainty around **trade barriers** arises from prolonged delays in getting agreement to build new Canadian oil pipeline capacity to access traditional US markets and new Asian export markets. Three major projects have received federal regulatory approval to expand export capacity but construction has not yet commenced. Also, uncertainty surrounding NAFTA renegotiations has greatly increased trade barrier concerns.

In terms of Climate Framework, Canada's provinces have already implemented a wide variety of climate policies and the federal government's Pan-Canadian Framework for Clean Growth and Climate Change contains measures to move Canada towards a low-carbon economy including carbon pricing and a requirement that provincial policies meet national standards. Significant uncertainties prevail due to dissimilar provincial climate policies across the country and prolonged negotiations to resolve federal-provincial differences.

Increased integration of **renewables** is driven by policies throughout Canada. For example, Alberta targets 30 % of generation from renewables by 2030, and neighbouring Saskatchewan aims for 50% by 2030. Ontario is one of the largest jurisdictions in the world to have eliminated coal-fired generation.

With respect to centralised generation, hydro-power contributes 60% of total electricity generation. Major hydro-power projects underway to increase clean hydro further include large 600MW+ hydro-power plants in Newfoundland and Labrador, Québec, Manitoba, and British Columbia. Large untapped hydro-power potential remains to be developed. Refurbishment of nuclear plants is underway in Ontario.

The advent of wind and solar farms, household-scale solar, and localised electricity storage have propelled the trend to more **decentralised electricity** generation in Canada. Decentralisation is seen to increase system reliability through increased diversification and wider geographic distribution of generation.

The rapidity of change, the unknown impact on traditional utilities, digitalisation, and the goals of improving reliability, reducing costs, and effectively managing systems have created great uncertainty and opportunities in the electricity sector.

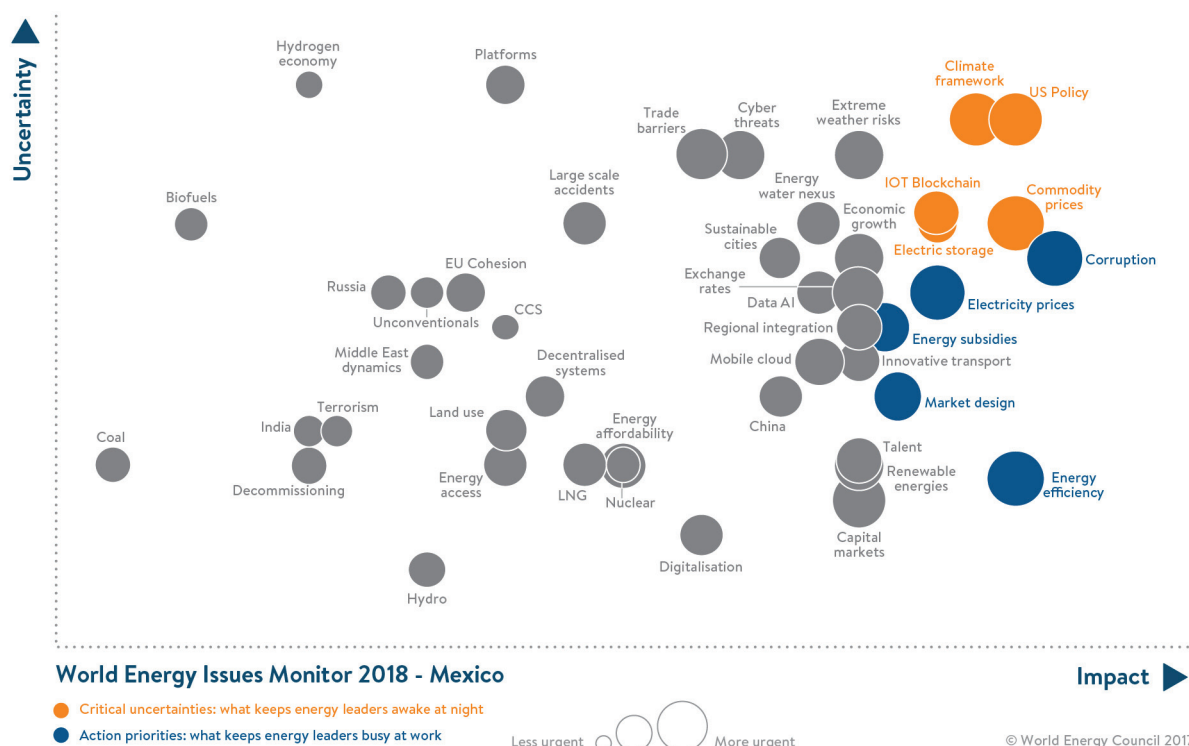
On the other hand, **electric storage** has moved from critical uncertainty in 2017 to a key component of Canada's electricity infrastructure. Utilities are integrating electricity storage in their current systems using a variety of technologies. Ontario's Independent Electricity System Operator has contracted for 56 MW of new storage capacity to enhance frequency regulation, provide ancillary services and to store off-peak generation supporting increased grid reliability and efficiency.

Ensuring greater awareness of energy's contribution to Canada's **Economic Growth** remains an important priority. Fulfilling this goal starts with providing objective, digestible, and up-to-date information about energy's significant contribution to Canada's GDP, employment, the balance of payments, and community development.

CONCLUSION

Canada is one of the world's few net exporters of every type of energy. Enhanced knowledge of the country's energy contributions will lead to well-informed policy and regulatory decisions both inside and outside the country.

MEXICO



NATIONAL OVERVIEW AND CONTEXT

Mexico's far reaching energy reform toward a competitive market is moving forward at a fast speed. The process has been conducted in open consultation with all actors involved, with a high degree of transparency fully recognised by all participants. However, risks of supply shortages for lack of sufficient infrastructure, the urgent need for existing infrastructure upgrade, particularly in the oil and gas sector, the necessary fine tuning of the new regulatory framework during the transition period and the logical resistance of the incumbent state own companies in transit from a state monopoly with little or no competition to the new competitive market framework are still issues that need to be closely monitored and clearly defined. In the oil and gas sector, the bidding process carried out in the exploration and production activities has generated an estimated 161 billion USD future investment both inland and offshore fields. In the electrical sector, the amount of renewable energy installed capacity reached 25.37% of the total in June of 2017 with increasing new capacity being committed such that the Intended Nationally Determined Contribution of Mexico presented at the Paris COP for 2024 of 35% of clean energy electricity generation is seen as having a high probability of occurrence.

» In 2018 Mexico will have a general election (presidential, state governorships, congressional as well as municipal). The political party leading the polls and its candidates question the energy reforms, promising to review and, in some cases, even to revert them. They have announced that oil & gas contracts that have been granted will be subject to review in order to be sure that they fully comply with the new legal framework, that fuels and electricity prices will be frozen and the role of the state own companies will be strengthened again. The

other item that in the past has created uncertainty is the ongoing renegotiation of the North American Free Trade Agreement (NAFTA).

KEY ISSUES FROM THE NATIONAL MONITOR

In the last year, there has been a continuous effort to carry out tasks that would minimise the uncertainties of the main critical issues and increase the actions to implement solutions related to the action priorities.

US Policy remains a high uncertainty in the Mexican energy sector, because of the increasing dependence on natural gas and oil products imports from the USA. Mexico's energy experts are beginning to question whether energy security is compromised because of such a high dependence from a foreign nation even if the supply is considered quite reliable.

In relation to the critical issues, when the survey was carried out, there was much uncertainty about the NAFTA negotiations, which created much uncertainty in these issues. At present, this has drastically changed and there is much optimism that soon the negotiations will successfully end. Due to this, **commodity prices** were a concern at that time because of the large volumes of natural gas and oil products imports and the potential threat of US imposing an export tax for some of these commodities. At present, the concern has withered very much. The issue of **climate framework** increased its uncertainty in the last year because of the fact that in the official indicative energy system forecast for a 15-year horizon, combined cycle with natural gas will be the dominant technology for electricity generation with the corresponding consequences in GHG emissions; this has generated renewed interest in carbon capture, utilisation and storage research and development activities.

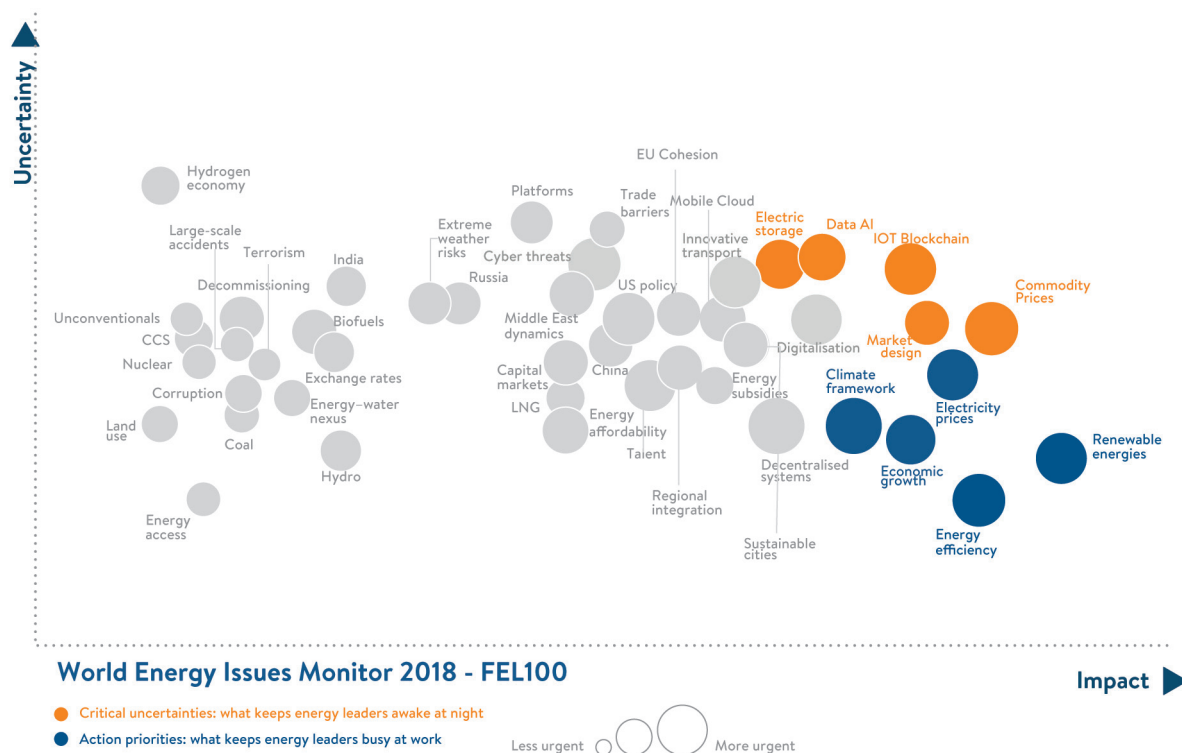
With respect to the priority actions, several events have occurred that have created a positive environment for the corresponding issues. A new set of laws were approved by Congress at the end of last year and the beginning of this year, creating a complex anticorruption system, headed by a General Attorney, confirmed by the Senate but independent of the executive branch of government as it is proposed by a civilian commission which is also appointed by the Senate. At present, the appointment of the persons involved in the various positions is in progress; however, because of the national elections mentioned above, the process has slowed down. In regard to electricity prices, these have been reset so that they reflect market prices except for small consumers which basically correspond to the poor segment of the population where subsidies are still in place. On the other hand, energy subsidies in the area of transport fuels (gasoline and diesel) have been mostly removed. As this is the first year that a competitive market operates in both the oil & gas as well as the electrical sector, adjustments have been and are being carried out in the corresponding market designs. As far as energy efficiency, a large effort was carried out in the recent past to develop over 120 quantitative indicators in several sectors specific for México; these will make possible the quantification of the efficiency gains in many processes and will certainly affect positively in the continuous decrease of the national energy intensity.

CONCLUSION

The Mexican energy sector is thriving in activity due to two main transformations that are taking place simultaneously. The first is a major structural change from a monopolistic to a competitive market structure. The second is the transformation of a very high carbon dependent energy sector to a low carbon system. At present, these transformations are occurring at an acceptable pace, with normal problems appearing but being solved along the way. The general election at midyear has introduced some uncertainty on the future progress of these transformations, but most experts are of the opinion that a drastic change in the course of these changes is not a simple task considering that there is already a large amount of momentum created in both processes.

Assessing the energy agenda for the Future Energy Leaders

THE FUTURE ENERGY LEADERS' AGENDA



OVERVIEW AND CONTEXT

The Future Energy Leaders (FELs) is a group of young, talented and ambitious energy sector professionals with a truly global mindset. In the Issues Monitor 2017 survey, FELs have identified critical issues which significantly overlap with those identified by the more experienced global energy leaders.

» FELs have placed a special emphasis on emerging topics such as IoT/Blockchain and digitalisation, demonstrating the attention that these technologies receive in the media and in today's energy debate. FELs have also attributed a importance to market design and climate framework, suggesting the need for greater attention to longer-term developments and for a new approach to "the old way of doing things".

KEY ISSUES FROM THE MONITOR

Commodity prices have increased in urgency compared to last year's FELs analysis. The evolution of oil markets, with the extension of the OPEC deal and increased competition due to the US shale offering, induces significant concerns for the months to come.

Climate framework emerges as a new action priority with growth in both urgency and impact over the previous year. As the attention paid to this subject at the WEC Executive Assembly and FEL Summit in Lisbon in 2017 demonstrated, the climate framework is a key element to the energy transition and to the transformation of the energy sector. FELs expect to see a continuous roll-out

of renewable generation, the curtailing of greenhouse gas emissions through enhanced and sustainable regulations.

The positioning of **renewable energies** and **energy efficiency** as action priorities illustrates the changing role of these technologies both because of countries' commitment to COP21 and as a reflection of decreasing costs, especially with regards to photovoltaic. Effective storage systems are an essential element to unlock the full potential of renewable generation by addressing the intermittency challenge and need to be promoted.

Digitalisation has shown remarkable movement by advancing in all three dimensions; uncertainty, impact and urgency. New technologies and replacement of old analogic infrastructure with smarter equipment, along with asset-less activities such as demand response, will have a major impact on the sector in the coming years. Although being a relatively new topic, IoT/Blockchain has gained great attention in the FEL-100 community, being perceived as a potential source of disruption to the sector.

Market design remains, nonetheless, one of the critical uncertainties in the FELs monitor with a higher impact than the preceding year. New business models are in the Future Energy Leaders' agenda with the belief that markets and regulations must adapt to better serve customer needs in the different world markets.

CONCLUSION

The FELs attention to innovation, technology and planning of the energy system as still uncertain but necessary tools to facilitate the energy transition have highlighted the need for greater dialogue and cooperation. These are seen as necessary tools to activate an enabling environment for these opportunities to be seized.

Appendix

Additional Country Maps

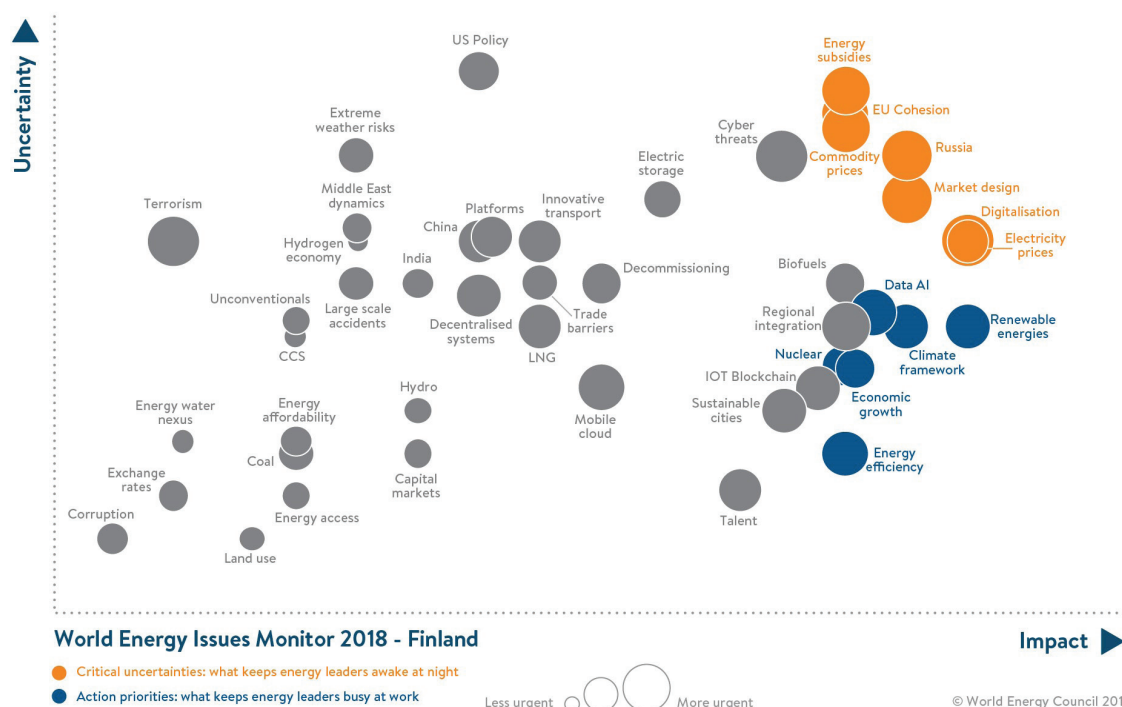
FINLAND
GHANA
INDONESIA

IRAN
IRELAND
TURKEY

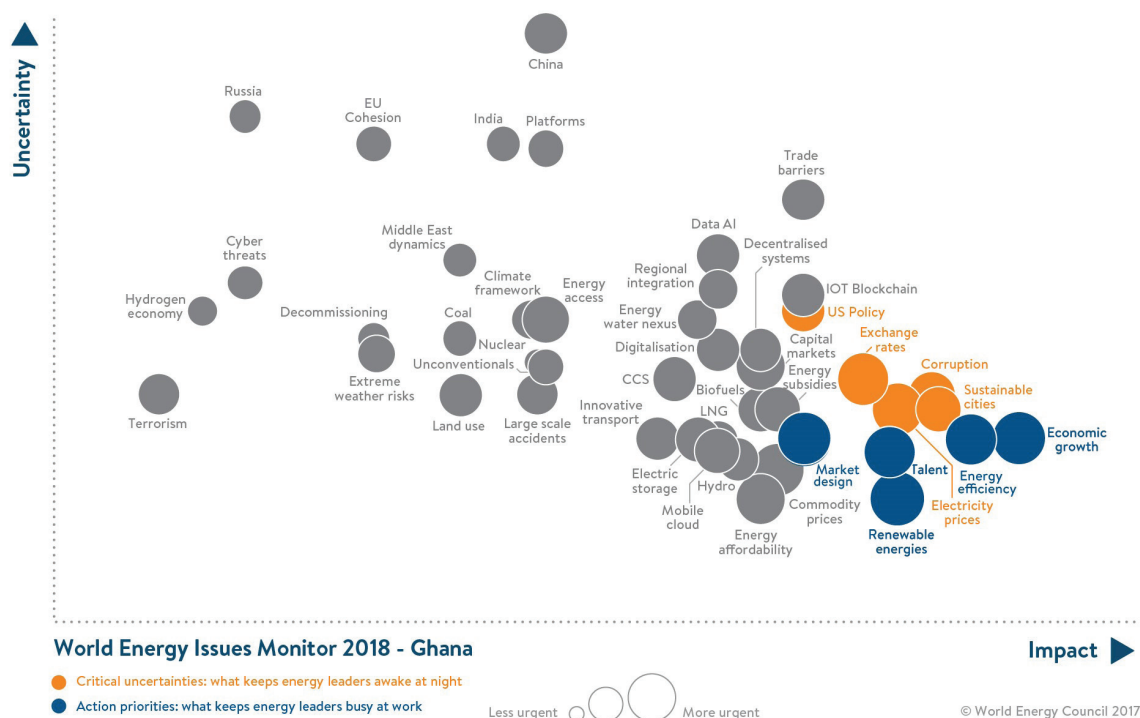
In addition to the commented country maps included in this report, the 2018 Issues Monitor Survey received exceptional response from Iran, Ghana, Finland and Turkey.

Due to a shortened deadline, these country commentaries are not yet included in this year's publication. Once approved, the narratives will be incorporated and the updated report will be made available on the WEC webpage.

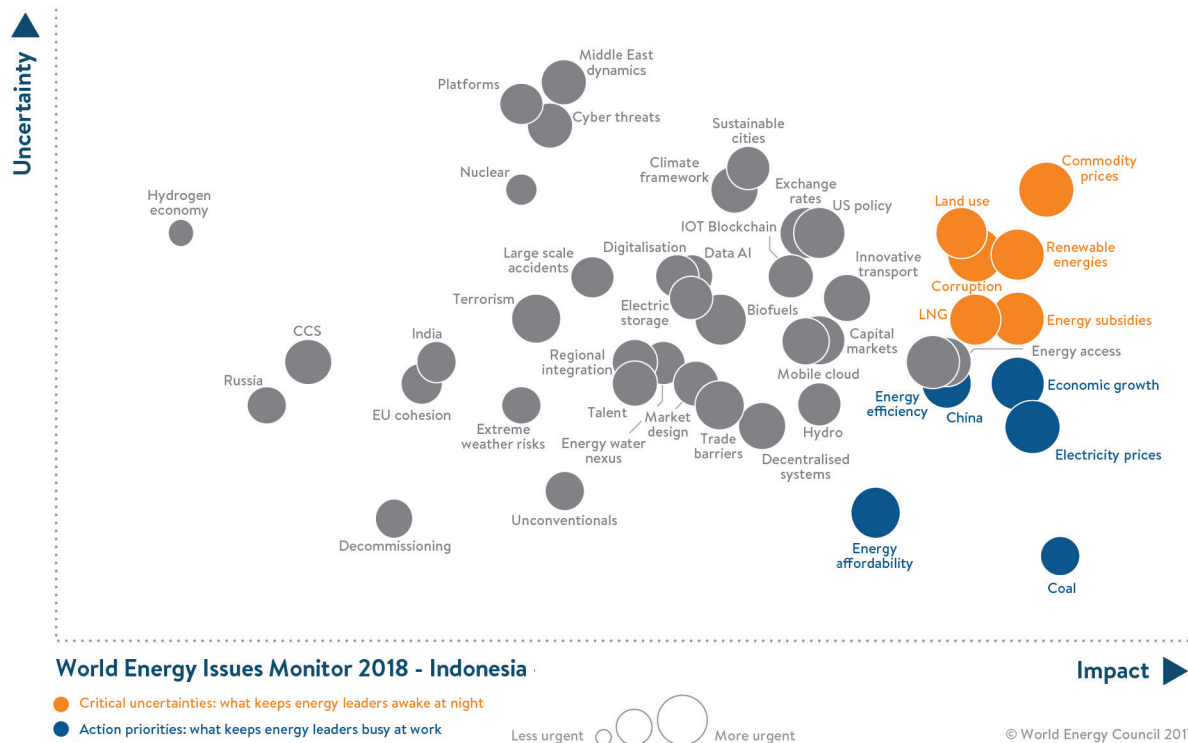
FINLAND



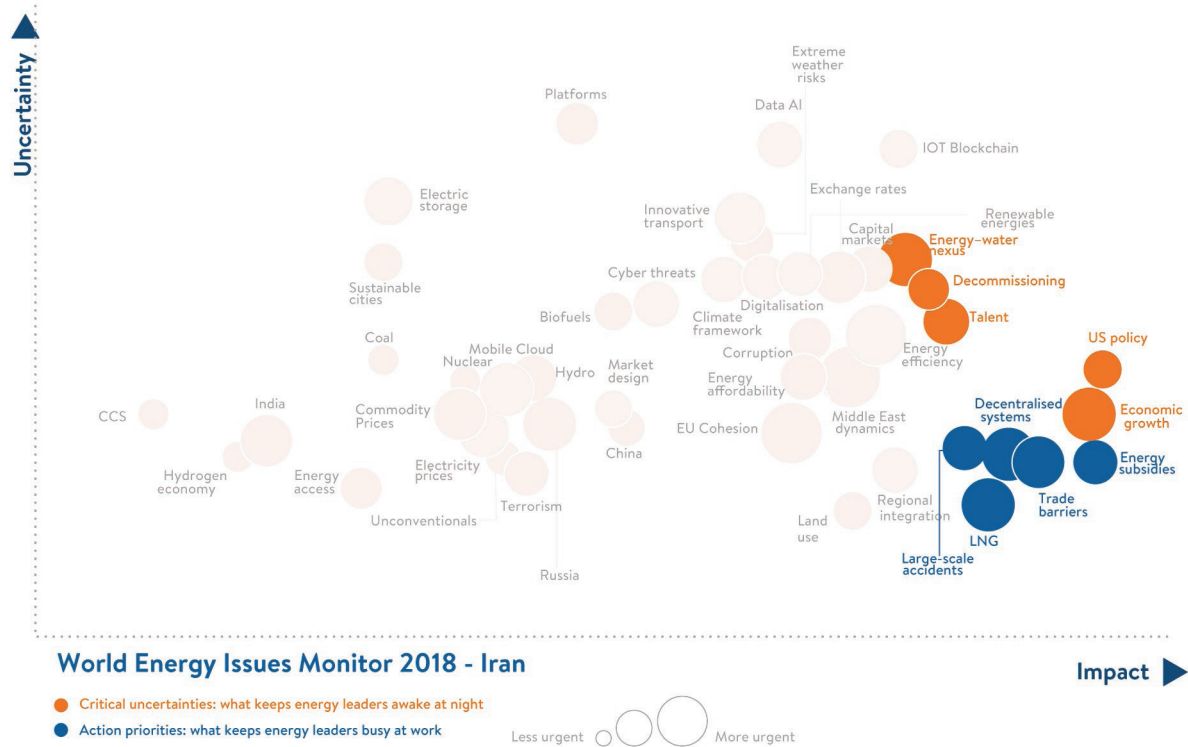
GHANA



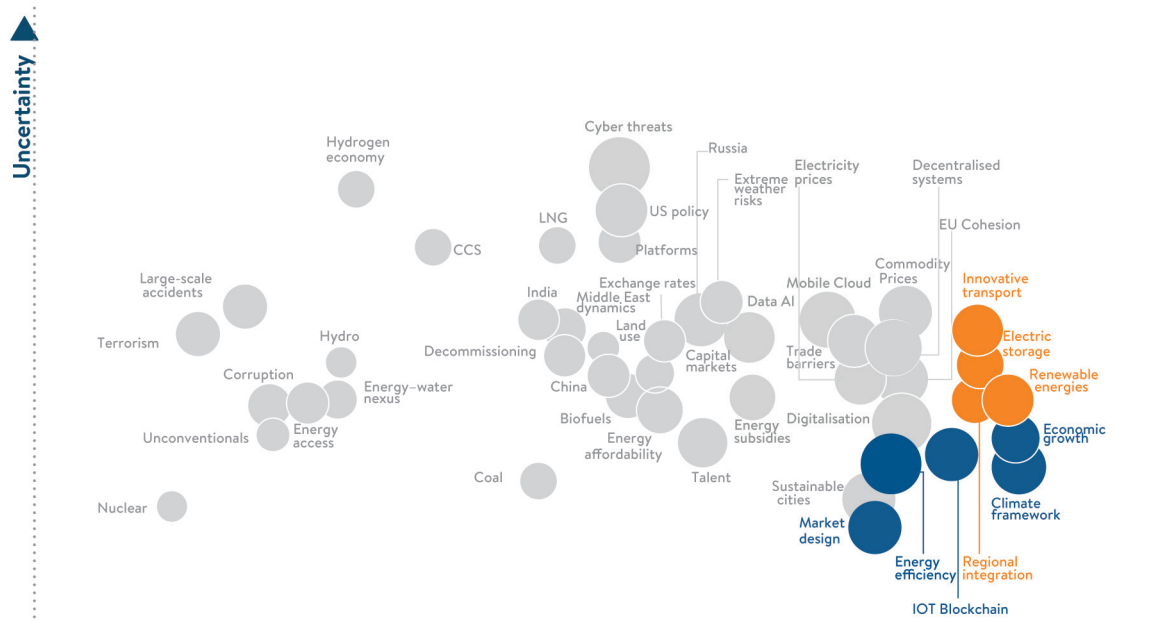
INDONESIA



IRAN



IRELAND



World Energy Issues Monitor 2018 - Ireland

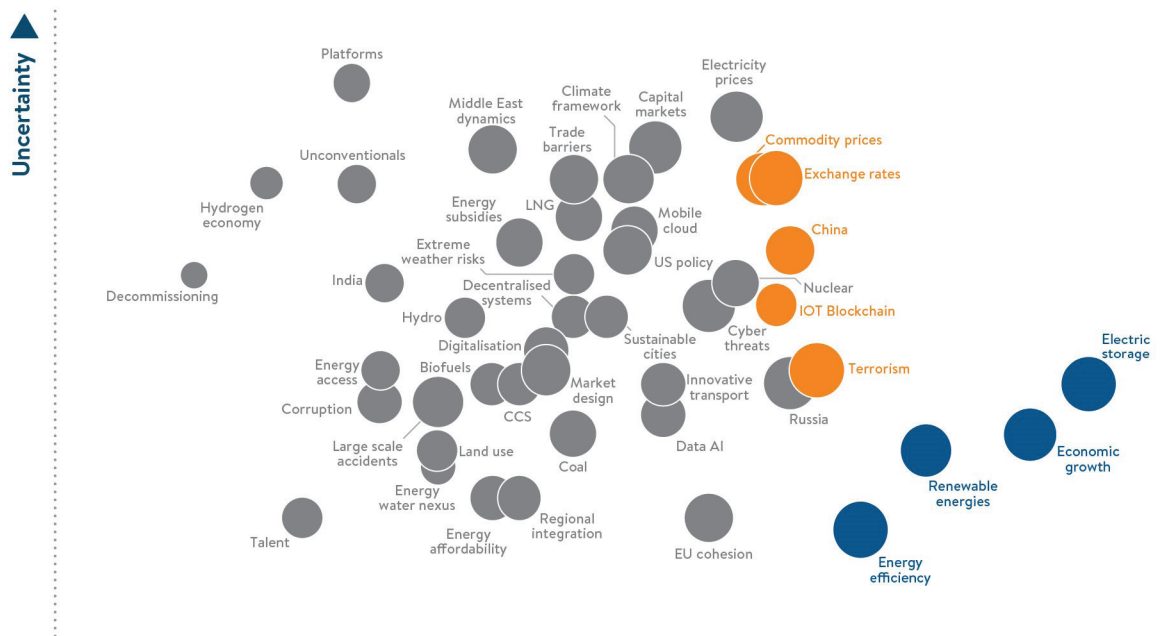
Impact ►

● Critical uncertainties: what keeps energy leaders awake at night

● Action priorities: what keeps energy leaders busy at work

Less urgent ○ ○ ○ More urgent

TURKEY



World Energy Issues Monitor 2018 - Turkey

Impact ►

● Critical uncertainties: what keeps energy leaders awake at night

● Action priorities: what keeps energy leaders busy at work

Less urgent ○ ○ ○ More urgent

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Methodology & Project Contributors

CONCLUSION

The World Energy Issues Monitor is based on an annual survey, comprising 42 issues across four categories: macroeconomic risks, geopolitics, business environment and energy vision and technology. The survey is completed by ministers, chief executives and leading experts in nearly 90 countries that are part of the network of the World Energy Council. The 2018 monitor is based on insights from over 1200 energy leaders from 90 countries.

The data for the 2018 World Energy Issues Monitor is input and normalised using statistical software in order to enable direct comparisons across regions and for different years. The data is normalised by the mean to give a central weighting and standard deviations to give the spread. The resulting issues monitors are then further contextualised by the analyses of World Energy Council regional managers, national committees and their broader national networks.

HOW TO USE THE ISSUES MONITOR FOR YOUR OWN COMPANY OR EXECUTIVE TEAM

Fully customised Issues Monitors can be used to benchmark your own understanding of the energy agenda against your regions of activity and to inform and engage executive boards and directors as well as government and policymakers, regarding the critical issues in your country. If your company or national committee are interested in looking at a bespoke monitor and debriefing, please contact Talita Covre by emailing covre@worldenergy.org.

THE INTERACTIVE ENERGY ISSUES MONITOR TOOL

The World Energy Issues Monitor provides unique global, regional and national perspectives which can be used in combination with our other tools such as the Energy Trilemma to enable countries to bring equity, security, and sustainability to all their citizens through the development of their national energy systems.

The World Issues Monitor Tool presents in one place dynamic map views of the decade of Issues Monitor data that has been collated by the World Energy Council. The maps convey a narrative of the key energy issues, regional and local variances and how these have changed over time. The tool allows the preparation of different maps for comparison and allows the manipulation of data by geography, over time, or by highlighting of specific energy issues.

- » The geographical views can now be broken out into a country level
- » The time view allows you to see how specific issues have developed whether globally, at a regional or country level
- » Issues can also be viewed according to certain categories such as OECD, non-OECD, G20 countries, innovators
- » Where specific narratives explaining the country data exist, they are included in the tool.

TABLE 1: THE WORLD ENERGY ISSUES

Macroeconomic Risks & Vulnerabilities	
Global climate framework agreement	Global climate negotiations and the implementation of COP21 agreements.
Large-scale accidents	Past and potential large-scale accidents and resulting implications, such as the Fukushima nuclear disaster and the Deepwater Horizon oil spill.
Economic growth	Effects of economic growth (or lack thereof) on energy markets.
Capital market access	Access to capital and the ability to deliver capital for energy infrastructure, in a context of high political, market and technology risks.
Energy & commodity prices	Price and volatility risks for energy and related commodities.
Electricity prices	Price and volatility risks for electricity.
Exchange rates	Exchange rate fluctuations and currency devaluation risks on energy operations and investments.
Energy-water-food nexus	Competition for water resources and water availability due to changing weather patterns and its effects on energy production and supply.
Land availability	Access to the required land for the supply, transport and distribution of energy and the social licence to operate value chain activities.
Talent availability	The availability of labour with the necessary skills, qualifications and experience.
Energy access	Lacking access to modern energy services including household access to clean cooking facilities and electricity.
Energy affordability – households	Share of household budget spent on energy including heating fuels, electricity and gasoline ('fuel poverty').
Extreme weather risks	Increased frequency and severity of extreme weather events (e.g. floods, storms, droughts) and the impact on energy systems and infrastructure design and resilience.
Cyber threats	Threats resulting from unauthorised attempts to access control system devices or networks within the energy sector and network providers.
Corruption	Slowing down the development of effective policies and distorting the competition.
Terrorism	Physical risks resulting from terrorism, affecting energy systems, infrastructure and markets.

Energy Geopolitics & Regional Issues

China growth	China driven innovation and policy influencing global energy trade, market dynamics and global governance.
India growth	India as the next engine of demand growth.
Russian foreign policy	Russia's foreign policy effects on domestic investment and operations, key energy partnerships and global energy markets.
EU Cohesion	Convergence to a common energy policy (critical market design; ETS -emission trading scheme-, capacity and storage incentives).
Middle East / North Africa fragility	Political regime fragility and geopolitical tensions affecting energy markets. US trade and policy influencing global energy markets: US driven innovation and policy influencing global energy trade, market dynamics and global governance.

Energy Policies & Business Environment

Trade barriers	Constraining or enabling green growth (e.g. through technology transfer, tariffs on green goods and services, local content requirements, border tax adjustment).
Regional integration	Converging energy policy to overcome unequal distribution and ineffective allocation of energy resources (e.g. interconnectors, pipelines, trade platforms) between countries, sub-regions or entire regions.
Innovative market design & policies	New market designs and policies securing back-up and storage capacity in natural gas and electricity markets.
Energy subsidies	Subsidies within the energy sector affecting the energy mix, competition, technology development and energy affordability.
Decentralised Systems	Innovative business models for demand side innovation and management.

Energy Vision & Technology	
Sustainable cities and urban design	Delivering resource-efficient urbanisation at scale; relating to management of waste, water, energy and transportation.
Energy efficiency	The role of measures (designs/operations/technologies) to reduce energy consumption.
Carbon capture and storage (CCS)	Carbon capture and storage (CCS): CCS as a technology to prevent large quantities of CO ₂ emissions from large scale fossil fuel power generation.
Smartgrid and big data	An electric power distribution network that includes two-way digital communication between consumer and producer, machines and the 'prosumer' as well as machine to machine.
Innovative transportation	Innovative transportation concepts, new modes and fuel sources including electric vehicles, hybrid and natural gas vehicles.
Electricity storage innovation	Price and scalability of batteries, 'power to gas' technology and storage as an enabler for greater integration of renewables.
Nuclear	The outlook for nuclear as part of the regional and global energy mix.
Large scale hydro-power	The outlook for large scale hydro as part of the regional and global energy mix.
Unconventional fossil fuels	The outlook for shale gas, oil shale and other 'unconventionals' as part of the regional and global energy mix.
Liquefied natural gas (LNG)	The role of liquefied natural gas (LNG) in regional and global energy markets.
Coal	The role of coal (lignite, anthracite, sub-bituminous, bituminous) as part of the regional and global energy mix.
Renewable energy	Rapid growth of renewable energy sources, especially solar PV and wind, affecting energy markets.
Biofuels	The outlook for biofuels as part of the regional and global energy mix.
Hydrogen economy	A pragmatic build-up to establish niche markets.

PROJECT PARTICIPATION

Regional breakdown of countries contributing to the World Energy Issues Monitor 2018

Africa

Botswana
Burkina Faso
Burundi
Cameroon
Chad
Congo (Democratic Republic of)
Cote d'Ivoire
Egypt
Ethiopia
Ghana
Guinea-Bissau
Kenya
Namibia
Niger
Nigeria
Senegal
South Africa
Swaziland
Tanzania
Tunisia
Uganda
Zimbabwe

Asia

Australia
Bangladesh
Cambodia
China
Hong Kong
India
Indonesia
Japan
Kazakhstan
Korea (Rep.)
Kyrgyzstan
Malaysia
Mongolia
Nepal

New Zealand
Pakistan
Philippines
Singapore
Sri Lanka

Europe

Austria
Belgium
Belarus
Bulgaria
Croatia
Cyprus
Czech Republic
Denmark
Estonia
Finland
France
Germany
Hungary
Iceland
Ireland
Italy
Latvia
Lithuania
Monaco
Netherlands
Norway
Poland
Portugal
Romania
Russian Federation
Serbia
Slovakia
Slovenia
Spain
Sweden
Switzerland
Turkey

United Kingdom

Latin America and the Caribbean

Argentina
Bolivia
Brazil
Chile
Colombia
Dominican Republic
Ecuador
Haiti
Panama
Paraguay
Peru
Trinidad & Tobago
Uruguay

Middle East and North Africa

Algeria
Bahrain
Egypt
Iran
Iraq
Jordan
Kuwait
Lebanon
Morocco
Oman
Qatar
Saudi Arabia
United Arab Emirates
Yemen

North America

Canada
Mexico
United States

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PRINCIPAL CONTRIBUTORS/WORLD ENERGY COUNCIL

Christoph Frei (Secretary General), Robert Hanf (Vice Chair, North America), Ibrahim Al-Muhanna (Vice Chair, Special Responsibility for Gulf States/Middle East), Leonhard Birnbaum (Vice Chair, Europe), Elham Mahmoud Ibrahim (Vice Chair, Africa), Claudia Cronenbold (Vice Chair, Latin America/Caribbean), Shigeru Muraki (Vice Chair, Asia Pacific/South Asia), Emily Melton (Special Advisor to the Secretary General), Latsoucabé Fall (Regional Manager, Africa), Einari Kisel (Regional Manager, Europe), Andrea Arrobo (Regional Manager, Latin America and the Caribbean), Angela Wilkinson (Senior Director), Marzia Zafar (Director), Sophie Rose (Senior Manager), Talita Covre (Manager), Maria Vinograd (Manager), Jorge Romeo (Manager) Joshua Oyinlola (Coordinator).

CONTRIBUTING MEMBER COMMITTEES FOR THE NATIONAL ANALYSES

ARGENTINA and Horacio Fernandez; AUSTRIA; BELGIUM and Bérénice Crabs and William D'haeseleer; BOTSWANA and Ms. Anne K. Leipego, Mr E. Kabelo, Mr L. Bafetanye, Mr S. Mukwaso, Mr G. Motladi; BRAZIL and Lauro Valdir de Souza; CAMEROON and Urbain Nzotcha; CANADA and Graham Campbell; CHILE; CHINA; COLOMBIA and Daniel Diaz; ESTONIA and Mihkel Härm; FINLAND; FRANCE and Jean Eudes; GERMANY and Christoph Menzel; GHANA; ICELAND and Baldur Pétursson INDIA and Mr. Seethapathy Chander; INDONESIA; IRAN; IRELAND; ITALY and Paolo Storti; JAPAN and Atsushi Noda; KENYA; LATVIA and Dr. oec. Gita Actina; LEBANON and Reem Irany; LITHUANIA and Gintaras Adzgauskas; MALAYSIA and Azlina Amin; MEXICO and Pablo Marcelo Mulas del Pozo; NAMIBIA and Tonateni Amakutuwa; NEW ZEALAND and John Carnegie and Tina Schirr; NIGERIA and Abubakar Sani Sambo and Ismail Zarma; POLAND and Mariusz Krupa; PORTUGAL and Bento Sarmiento; SERBIA and Prof. Dr. Miodrag Mesarović; SLOVENIA and Franc Žlahtič; SOUTH AFRICA and D.W.Wright and B.A.Statham; SPAIN and Maria Olalla del Rio Barrio; and TURKEY.

CONTRIBUTING FUTURE ENERGY LEADERS FOR THE FEL ASSESSMENT

Sultan Al Shaaibi (Oman), Andreas Formosa (United Kingdom), Andrei Covatariu (Romania), Bennet Tucker (New Zealand).

PROJECT MANAGEMENT

Marzia Zafar (Director), Talita Covre (Manager), Jorge Romeo (Manager).

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	Paraguay	

62–64 Cornhill
 London EC3V 3NH
 United Kingdom
 T (+44) 20 7734 5996
 F (+44) 20 7734 5926
 E info@worldenergy.org